The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago

MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President
N. C. ROCKWOOD, Vice-President
GEO. P. MILLER, Treasurer
C. O. NELSON, Secretary

NATHAN C. ROCKWOOD, Editor

H. E. HOPKINS, GEO. M. EARNSHAW, Associate Editors

CLINTON S. DARLING, Promotional Manager

C. A. BRESKIN, Advertising Manager
E. M. GIBSON, Assistant Manager
J. K. COSTELLO, Central Rep.
A. B. SANGER, Eastern Rep.

GEO. P. MILLER, General Manager

SUBSCRIPTION—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

TO SUBSCRIBERS—Date on wrappers indicate issue with which your subscription expires. In writing to have address changed, give old as well as new address.

Volume 25 November 4, 1922 Number 22

CONTENTS

This Stone Plant Is a Model of Efficiency and Economy.... 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

The recently completed stone-crushing and pulverizing units are without precedent. Reinforced concrete storage tanks among the many special features

Position of Non-Metallic Minerals in the Mining Industry 23, 24, 25, 26

Showing the difference between the metallic and non-metallic minerals, the reasons for inefficiency in the latter industry and the present trend toward better conditions

Doubling the Bin Capacity of a Sand and Gravel Plant.... 28, 29, 30, 31

The Southern Sand, Gravel and Supply Co. has increased its bin capacity from 1000 to 3000 tons. It has a truck and wagon trade

Screens for Washing Plants.... 32, 33, 34, 35

Production Costs of Rock Products.... 36, 37, 38, 39

Here is told why there should be wider use made of mechanical equipment, improvements in overburden removal, byproducts development, cost-keeping, etc.

Basic Slag Losing Out as a Competitor of Rock Phosphate 40

The new steel-making process has reduced the plant food content

Proposed Constitution of the Sand and Gravel Association 41

British Quarry Practice.... 42, 43

Hints and Helps for Superintendents.... 44, 45

Quarried from Life.... 46

Editorial.... 47

Rock Products Market.... 48, 49, 50, 51

New Machinery and Equipment.... 52, 53, 54

News of All the Industry.... 55, 56

Profitable Reading for All

GOOD things aren't much good so long as they are kept up someone's sleeve. In the last issue we promised that the editors, as usual, had up their sleeves some good things from which the readers of ROCK PRODUCTS will get a lot of interest and profit in reading. Right away they draw some of those things from their sleeves and here they are in this issue. Don't miss the real meat in these helpful articles.

Take first the article by Mr. Ladoo, who points out the size and importance of the non-metallic mineral field and suggests some of the remarkable possibilities of the gravel, stone, lime and other similar rock products industries. Mr. Ladoo shows the need for more engineering in these industries; he tells what can be learned from the metallic mining industries; he shows where the inefficiencies of these industries lie, and the reason for them; he tells where better standards and specifications are needed; and he points to the present trend toward increased efficiency which, if continued, will mean great progress and greatly increased business in these industries.

Then turn to the article by Oliver Bowles. There will be found practical methods of lowering the production costs in all the non-metallic mineral industries —methods showing more effective use of mechanical equipment, better stripping methods, how to cut blasting costs, the use of mechanical loading and simpler transportation systems, effective methods of eliminating waste, the development of byproducts, the advantages of cost-keeping and of association work.

These two articles alone would make this issue worth while to every subscriber, but they are not by any means all that it contains.

* * *

For the Stone Producer

ONE of the best things coming out of the editorial sleeve and into this issue interests particularly the stone producer. It is the article describing the Limestone Products Corporation of America—a plant just completed and the last word in stone production methods. The plant is the result of a personal study of nearly every stone and cement plant in the country, with the good points of each incorporated in this new and efficient plant. The article describing it goes into great detail, and the many illustrations show how the important parts of the plant appear.

* * *

For the Sand and Gravel Man

EVERY gravel producer wants his washing plant to be effective at low cost, and upon the proper selection and installation of screens a great deal of this washing plant efficiency depends. For the first time the subject of screens for washing plants is being comprehensively and authoritatively covered for the benefit of sand and gravel producers. The second article of a series by Edmund Shaw appears in this issue, and every paragraph is filled with information the gravel man needs to know.

Besides, in this issue is an article describing and illustrating the Southern Sand, Gravel and Supply Co.'s plant and operations, particularly telling how the company has doubled its bin capacity.

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago

MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President
N. C. ROCKWOOD, Vice-President
GEO. P. MILLER, Treasurer
C. O. NELSON, Secretary

NATHAN C. ROCKWOOD, Editor

H. E. HOPKINS, GEO. M. EARNSHAW, Associate Editors

CLINTON S. DARLING, Promotional Manager

C. A. BRESKIN, Advertising Manager
E. M. GIBSON, Assistant Manager
J. K. COSTELLO, Central Rep.
A. B. SANGER, Eastern Rep.

GEO. P. MILLER, General Manager

SUBSCRIPTION—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

TO SUBSCRIBERS—Date on wrappers indicate issue with which your subscription expires. In writing to have address changed, give old as well as new address.

Volume 25 November 4, 1922 Number 22

CONTENTS

This Stone Plant Is a Model of Efficiency and Economy.... 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

The recently completed stone-crushing and pulverizing units are without precedent. Reinforced concrete storage tanks among the many special features

Position of Non-Metallic Minerals in the Mining Industry 23, 24, 25, 26

Showing the difference between the metallic and non-metallic minerals, the reasons for inefficiency in the latter industry and the present trend toward better conditions

Doubling the Bin Capacity of a Sand and Gravel Plant.... 28, 29, 30, 31

The Southern Sand, Gravel and Supply Co. has increased its bin capacity from 1000 to 3000 tons. It has a truck and wagon trade

Screens for Washing Plants.... 32, 33, 34, 35

Production Costs of Rock Products.... 36, 37, 38, 39

Here is told why there should be wider use made of mechanical equipment, improvements in overburden removal, byproducts development, cost-keeping, etc.

Basic Slag Losing Out as a Competitor of Rock Phosphate 40

The new steel-making process has reduced the plant food content

Proposed Constitution of the Sand and Gravel Association 41

British Quarry Practice.... 42, 43

Hints and Helps for Superintendents.... 44, 45

Quarried from Life.... 46

Editorial.... 47

Rock Products Market.... 48, 49, 50, 51

New Machinery and Equipment.... 52, 53, 54

News of All the Industry.... 55, 56

Profitable Reading for All

GOOD things aren't much good so long as they are kept up someone's sleeve. In the last issue we promised that the editors, as usual, had up their sleeves some good things from which the readers of ROCK PRODUCTS will get a lot of interest and profit in reading. Right away they draw some of those things from their sleeves and here they are in this issue. Don't miss the real meat in these helpful articles.

Take first the article by Mr. Ladoo, who points out the size and importance of the non-metallic mineral field and suggests some of the remarkable possibilities of the gravel, stone, lime and other similar rock products industries. Mr. Ladoo shows the need for more engineering in these industries; he tells what can be learned from the metallic mining industries; he shows where the inefficiencies of these industries lie, and the reason for them; he tells where better standards and specifications are needed; and he points to the present trend toward increased efficiency which, if continued, will mean great progress and greatly increased business in these industries.

Then turn to the article by Oliver Bowles. There will be found practical methods of lowering the production costs in all the non-metallic mineral industries —methods showing more effective use of mechanical equipment, better stripping methods, how to cut blasting costs, the use of mechanical loading and simpler transportation systems, effective methods of eliminating waste, the development of byproducts, the advantages of cost-keeping and of association work.

These two articles alone would make this issue worth while to every subscriber, but they are not by any means all that it contains.

* * *

For the Stone Producer

ONE of the best things coming out of the editorial sleeve and into this issue interests particularly the stone producer. It is the article describing the Limestone Products Corporation of America—a plant just completed and the last word in stone production methods. The plant is the result of a personal study of nearly every stone and cement plant in the country, with the good points of each incorporated in this new and efficient plant. The article describing it goes into great detail, and the many illustrations show how the important parts of the plant appear.

* * *

For the Sand and Gravel Man

EVERY gravel producer wants his washing plant to be effective at low cost, and upon the proper selection and installation of screens a great deal of this washing plant efficiency depends. For the first time the subject of screens for washing plants is being comprehensively and authoritatively covered for the benefit of sand and gravel producers. The second article of a series by Edmund Shaw appears in this issue, and every paragraph is filled with information the gravel man needs to know.

Besides, in this issue is an article describing and illustrating the Southern Sand, Gravel and Supply Co.'s plant and operations, particularly telling how the company has doubled its bin capacity.

Will not freeze in any weather

DUMORITE—the new Du Pont dynamite which gives you over ⅓ more work for your dollar—is *non-freezing*.

By rigorous laboratory tests and extensive field operations we find that Dumorite can be shot successfully at any temperature. It is just as good in below-zero weather as in the summer time.

Stick for stick, Dumorite does approximately the same work as 40% dynamite, but you can buy 135 to 140 sticks of Dumorite at the same price as 100 sticks of "40%." And Dumorite is a guncotton-nitroglycerin dynamite that will not cause headache.

Dumorite is being used successfully in most kinds of explosive operations. Write our nearest branch office giving details of your particular work and let our Service Department solve the problem of fitting Dumorite to your job. Let Dumorite reduce your explosives bills for 1922.

E. I. du Pont de Nemours & Co., Inc.

Explosives Department

Wilmington, Delaware

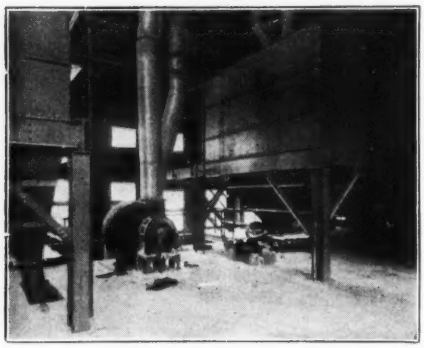
BRANCH OFFICES:

Birmingham, Ala.	Denver, Colo.	New York, N. Y.	San Francisco, Calif.
Boston, Mass.	Duluth, Minn.	Pittsburgh, Pa.	Scranton, Pa.
Buffalo, N. Y.	Huntington, W. Va.	Portland, Ore.	Seattle, Wash.
Chicago, Ill.	Kansas City, Mo.	St. Louis, Mo.	Spokane, Wash.
	Springfield, Ill.		

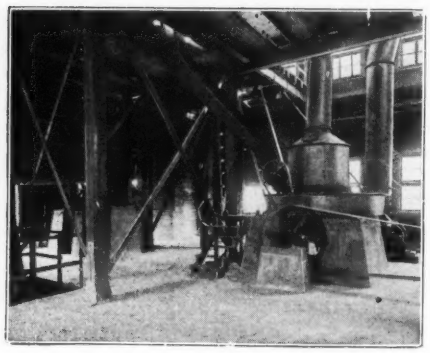
Du Pont Products Exhibit
Atlantic City, N. J.

NON-HEADACHE DU PONT NON-FREEZING

DUMORITE



Raymond Special Exhaust Fan Direct Connected to Motor



Raymond Roller Mill with Gypsum Dryer in Background at Left

Raymond Roller Mills For Hydrated Lime

For those producers of Hydrated Lime who have a high grade material from which they do not wish to remove the impurities such as core, sand, and over burned lime, Raymond Roller Mills will give just the kind of finished product wanted.

They will reduce all of the Hydrate, including the impurities, to a fine uniform powder which is Air-Separated to remove oversize material, and deliver finished product direct to storage bins above the bagger.

The grinding is done at an exceedingly low cost for power and repairs.

We invite correspondence from those who feel that all the lime can be ground up without removal of impurities and especially those who are now grinding on some other type of mill, as we feel that the figures we now have on operating costs will show that Raymond Roller Mills will pay for themselves in one to two years' time.

Raymond Bros. Impact Pulverizer Co.

1301 North Branch Street Chicago, Ill.

Western Office: 1002 Washington Bldg., Los Angeles, Calif.
Eastern Office: 50 Church St., New York City

ANNOUNCEMENT OF
Prize Contest

Prizes:

FIRST PRIZE, $100.00 and a solid gold watch, 17 jewel, Waltham movement, case engraved with winner's name and standing in contest.

SECOND PRIZE, $50.00 and a solid gold watch, 17 jewel, Waltham movement, case engraved with winner's name.

THIRD PRIZE, $25.00 and a solid gold watch, 15 jewel, Waltham movement, case engraved with winner's name.

FOURTH PRIZE $20.00
FIFTH PRIZE $15.00
SIXTH PRIZE $10.00
SEVENTH PRIZE $10.00
EIGHTH PRIZE $10.00
NINTH PRIZE $10.00
TENTH PRIZE $10.00
ELEVENTH PRIZE to 20TH PRIZE, inclusive, each $5.00

In addition to the above awards, $5.00 will be paid for each record that is published.

Object of contest:

We are going to settle the question of how much it costs to keep up a well-built steam shovel.

Some steam shovel owners have said that manufacturers are optimistic in giving out repair figures. The ERIE Steam Shovel Co. has always been ***conservative***, over-cautious. Upkeep costs have in many cases been placed higher than we knew them to be— because we did not want the average shovel owner to expect unusual results from an average field organization.

Now, however, we are going to perform a service to the steam shovel owner by getting together many actual records, and publishing them in full detail.

To secure as many records as possible, we are offering prizes for the best reports giving ***low upkeep cost*** records made by ¾ cu. yd. shovels which have received good care. We are going to award 20 prizes ranging from a first prize of $100.00 and a good gold watch, down to $5.00, in addition to $5.00 for each record that is published. (See list of prizes, in upper left hand corner.)

In order to avoid comparisons which might reflect unfavorably upon other makes of steam shovels, it has been decided to limit the entries to ERIE Shovels only.

How to enter the contest:

Records may be sent in by steam shovel owners, by managers, or any employee who is in direct contact with the shovel work— the superintendent, engineer, foreman, or steam shovel operator. But in every case there must be a written statement by the owner of the machine, to the effect that the figures submitted are correct to the best of his knowledge.

Not more than one letter can be entered from one concern. If two or more entries covering different machines are received from one company, the best letter sent in will be considered. Contest closes December 31, 1922.

Information to be given in letter:

(1) Approximate number of days worked by shovel since put into service.

(2) Approximate number of cubic yards of material handled— stating how much classified as earth, how much rock, how much shale, etc.

(3) Total amount spent for repair parts. (Do not include dipper teeth, hoisting cable, or grate bars, as these are wearing parts which need replacement on any shovel that is working, even when it receives the best possible care.)

(4) Total lost time, during which the work was delayed for repairs to shovel.

Besides the above information, any additional details of interest should be included — together with one or more photographs of the shovel in action, if available.

Address your letter to

A. C. Vicary, Vice President,
ERIE Steam Shovel Co., Erie, Pa.

Judges:

The letters will be rated, and the prizes awarded, by the following board of judges:

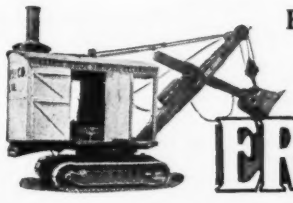
ARTHUR S. BENT, of Bent Brothers, Los Angeles, Calif., pioneer contractors on large hydro-electric and irrigation project construction; President of the Associated General Contractors of America.

HALBERT P. GILLETTE, editor of "Engineering & Contracting" magazine, and author of "Handbook of Cost Data," "Rock Excavation," and many other engineering works.

ARTHUR C. VICARY, Vice President of the ERIE Steam Shovel Co.; mechanical engineer with many years of specialized experience on steam shovel work.

In making the awards, the judges will consider the actual record made by the shovel, and also interesting and informative details that are given in addition to the actual record. If two machines were to make exactly the same record, the more interesting and informative letter would be given the higher rating; photographs also would be considered.

If your firm does not own an ERIE and you cannot enter this contest, please refer this advertisement to someone who can act upon it. Thank you!



ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Incorporated 1883. Formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Chicago Representatives throughout the U. S. A.

Tough Shooting Job—Here!

But look at the Results!

SEAMY, open, loose formation of the limestone—hard to get a shot to hold so that it would have enough shattering effect. That was the condition.

In went Grasselli Explosives. Now look at the picture—that tells the story. Grasselli pulled clean from the face and left mighty little for secondary shooting.

Shovels could go right to work and they could work clear up to the face.

That quarry operator was certainly pleased! Have you a set of tough conditions that you would like one of our field men to look over? They all are practical men, experienced in quarry blasting practice and explosives. When shall he call?

The Grasselli Powder Company

Main Office: Cleveland, Ohio

New York Office: 117 Hudson Street

Philadelphia
Pittsburgh
Chicago

CHEMICALS ZINC GRASSELLI EXPLOSIVES DYESTUFFS

Wilkes-Barre, Pa.
Pottsville, Pa.
Bluefield, W. Va.

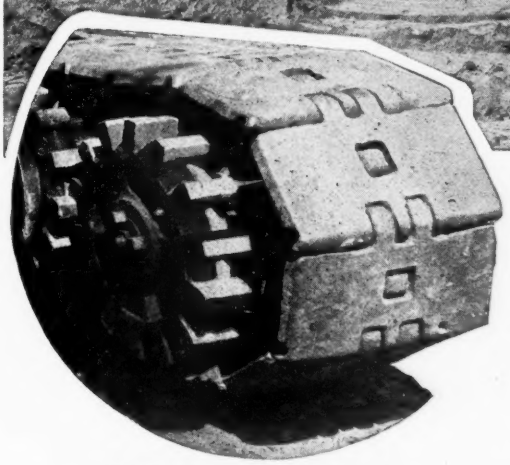
Birmingham

GRASSELLI EXPLOSIVES

NOT often are you in close quarters where a short turning radius is required. But when you do need it you'll appreciate what the New 21 will do.

Steers Entirely from the Cab

Some shovels steer from the cab but the steering connections must be operated from the ground. On the New 21 the operater does not leave the cab nor need outside assistance connecting and disconnecting chains, bars or clutches. All that is necessary is to operate a handy lever inside of the cab that enables the shovel to be steered in any direction.



TheNewMarion21

Power, Speed and Mobility Unparalled

PERFECTION in a ¾-yard revolving shovel is achieved to the highest degree yet reached, in this new Marion 21.

The contrast between performance as you have heretofore experienced it, with the abundant power, smooth operation and ease of handling of the New 21 is so marked that it immediately manifests itself in a most surprising way.

It has all the natural swift response of a shovel well proportioned and properly balanced. Its steady sustained speed under burden of heavy work proves ruggedness and power unexcelled. Its performance *under all conditions* is ample proof that we have introduced into the fabrication of this Model elements never before possessed by a shovel of this size.

Bulletins 228 and 305 tell interestingly and completely of the many superior features of this New 21. Your copies will be sent promptly upon request.

Self-Cleaning Teeth in the Propelling Gears

This is only one of the many novel and original features in the rigid crawler trucks of the New 21. Gear teeth are extra heavy and the bottom of the spaces between the teeth are beveled to throw off stones, roots, and debris of all kinds.

Pads are all-steel crowned and with overlapping edges to protect pavements. The connecting pins have five bearings in quadruple shear and much stronger than ordinarily used.

264

The Marion Steam Shovel Company

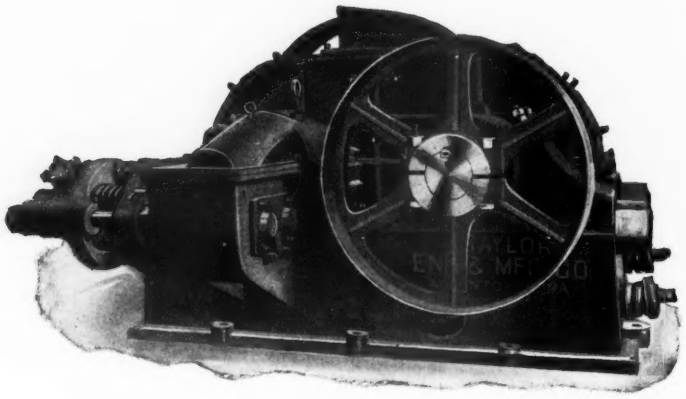
Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy

ENDURINGLY EFFICIENT

TRAYLOR

HEAVY DUTY CRUSHING ROLLS



WILL serve you efficiently and economically in almost any capacity except primary breaking.

Their chief recommendation is their enormous output for the power expended — a very important consideration where power cost is high, or labor expensive.

THE PATENTED FLEETING DEVICE

Procurable with no other machine, makes this efficiency and economy possible, because, by preventing annular corrugation and flanging of shells, the steel cost per ton of product is reduced to the minimum and continuous operation is guaranteed.

See our Bulletin R2P for detailed description

TRAYLOR ENGINEERING AND MANUFACTURING COMPANY

ALLENTOWN, PA.

NEW YORK 30 Church St. | PITTSBURGH 1133 Fulton Bldg. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES Citizens Nat. Bank Bldg. | SEATTLE 815 Alaska Bldg.

TULSA, OKLA. 505 Central Nat. Bank Bldg. | NEW ORLEANS 1215 New Hibernia Bank Bldg. | SALT LAKE CITY 111 Dooly Bldg. | TIMMINS, ONT., CAN. Moore Block

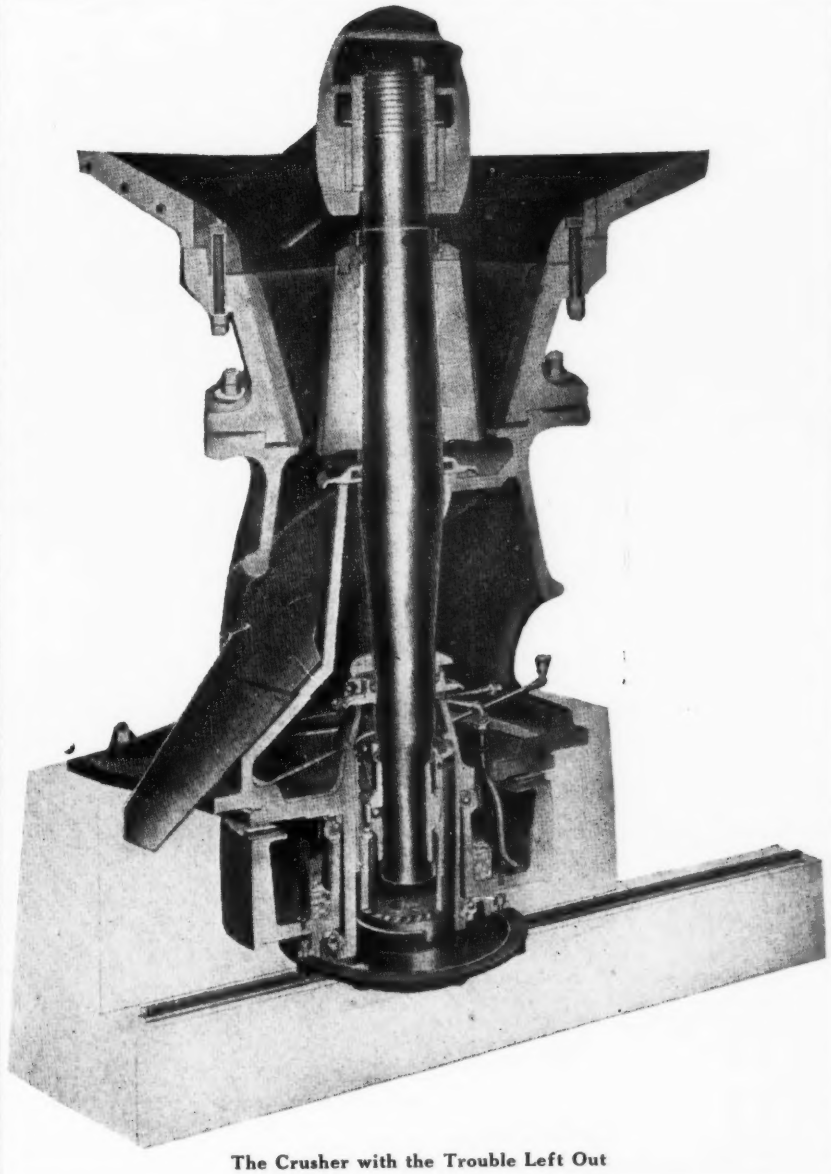
TRUCK AND TRACTOR DIVISION, CORNWELLS, PENNA.

EXPORT DEPARTMENT, 104 PEARL ST., NEW YORK CITY. CABLE ADDRESS "FORSALTRA"

International Machy. Co. SANTIAGO, CHILE | W. R. Grace & Co. LIMA, PERU | International Machy. Co. RIO DE JANIERO, BRAZIL

Kennedy Gearless Crushers

For Any Size and Capacity



The Crusher with the Trouble Left Out

Points of Superiority

1. Less Power Consumption
2. Low Operating Cost
3. Continual Operation —Not Limited to Safe Gear Speed — Strikes a Harder Blow, and Has Increased Capacity
4. Perfected Dust Proof Oiling System
5. Can Be Set in Any Position—And Takes Less Room
6. Equipped with Patented Ball and Socket Eccentric.

Parts Eliminated

1. Outboard Bearing
2. Counter Shaft
3. Inner Bearing Cap
4. Base, and Support
5. Thrust Ring
6. Pinion
7. Gear
8. Key for Gear
9. Two Steel Wearing Rings
10. Bronze Wearing Rings.

Parts Added

1. Set Balls
2. Ball Race Rings
3. Ball Retainer.

This improvement has actually reduced cost of maintenance 80%, not including head and concaves.

Write for Catalogue and Information

Kennedy Van Saun Mfg. and Eng. Corp.

120 Broadway, New York

Cieves Enterprises Industrielles, Paris **Harron Rickard & McCone, Inc., San Francisco and Los Angeles**

One Man Can Easily Control and Operate the TANKTRED Loader

NOTE by the illustrations how the simple levers are easily reached by the operator. Complete independence of each function.

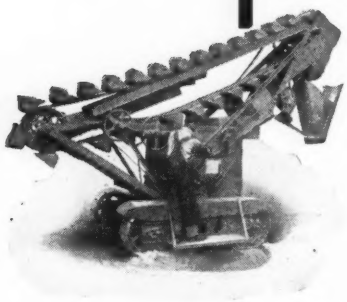
Propelling, Steering, and Operation of elevator are accomplished through multiple disc clutches. Machine is turned on the center of either crawler as a pivot.

A Rugged Loader, Mechanically Correct in every detail, that will readily **dig** and **load** Crushed Stone, Sand, Gravel, Coal, Coke and other materials at the rate of 1½ to 2 cubic yards per minute.

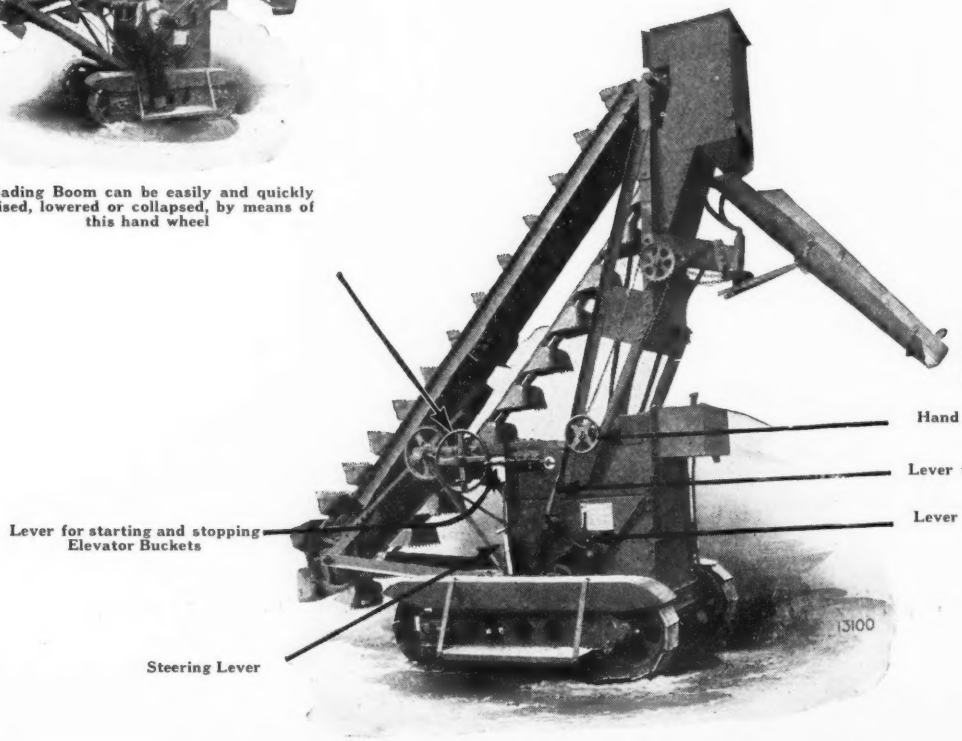
Let us tell you more about it

The Jeffrey Manufacturing Co.

935-99 North Fourth Street, Columbus, Ohio



Loading Boom can be easily and quickly raised, lowered or collapsed, by means of this hand wheel



Universal Swivel Spout allows truck to be completely filled without moving truck or loader.

Hand Wheel to control spout

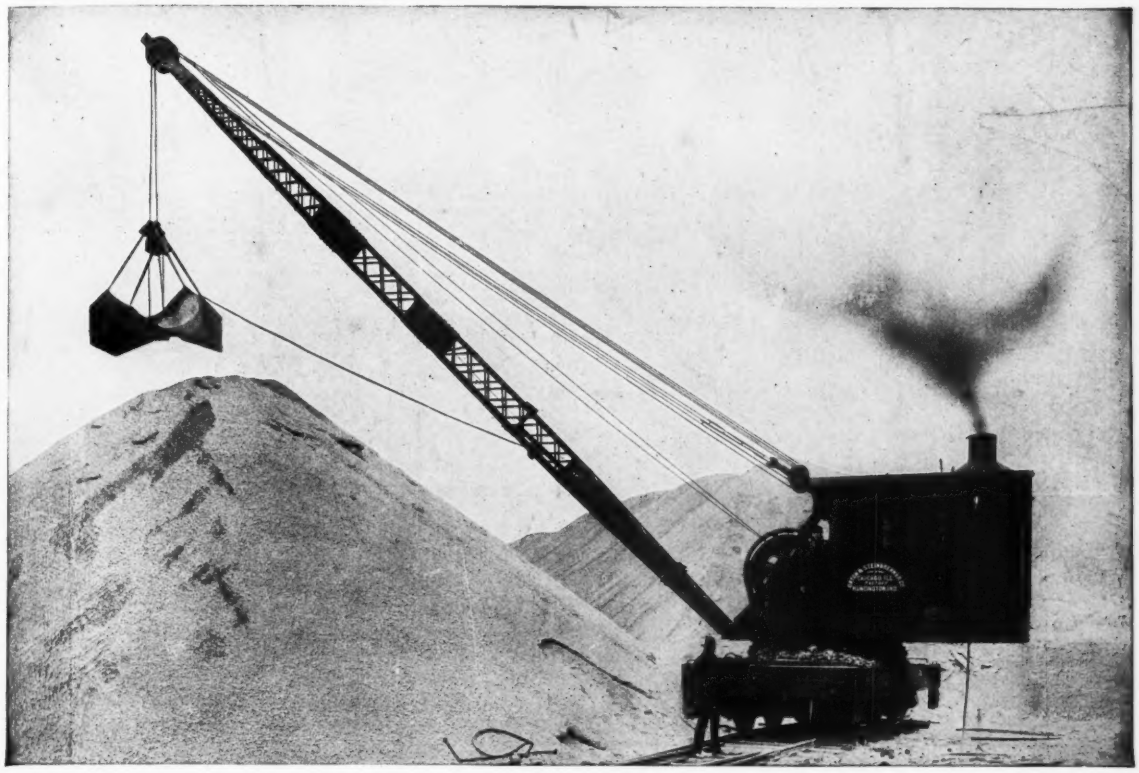
Lever to control rate of travel

Lever for regulating direction of travel

Lever for starting and stopping Elevator Buckets

Steering Lever

When writing advertisers please mention ROCK PRODUCTS



30-TON CRANE
With 60-ft. boom and 2-yd. bucket

O. S. DEPENDABLE

LOOK at the problem squarely—Some day you will use O-S-Dependable Cranes and Grab Buckets and forever after you will be a defender of their merits.

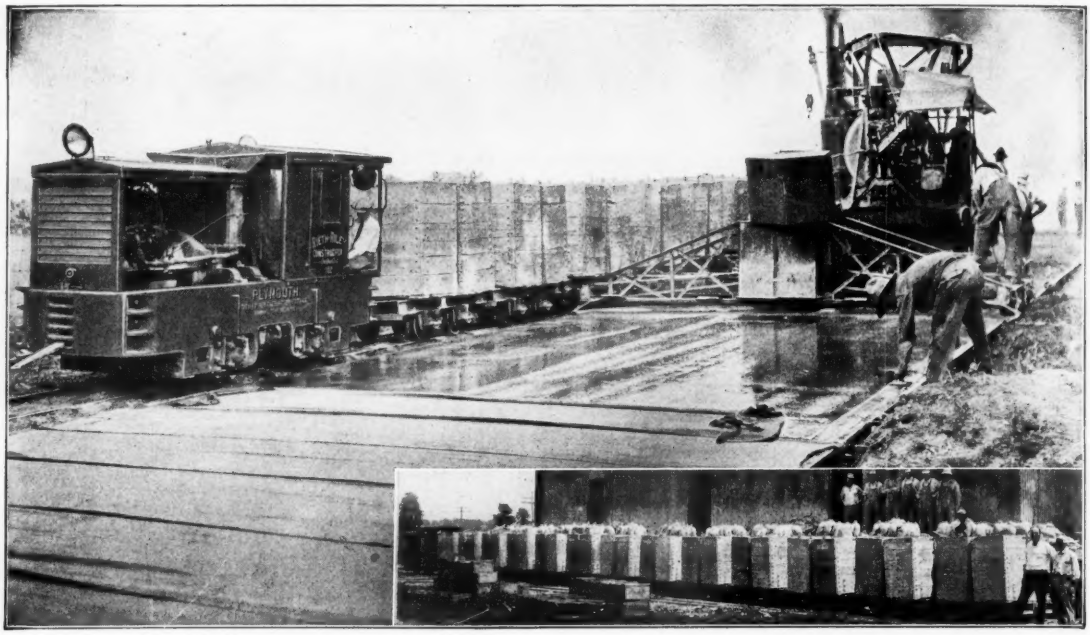
The material handling machinery made by Orton and Steinbrenner Co. is not "just suitable." It is unsurpassed for simplicity and accessibility. The quality of the material and workmanship insures a rare economy of performance.

Our booklet on this subject is profusely illustrated with photos of our cranes on the job and contains a world of information concerning details that are far beyond the space limitations of this advertisement.

It will be sent to you on request

Orton & Steinbrenner Company
CHICAGO

Factory—Huntington, Ind.



Equipment of Rieth-Riley Construction Co., Goshen, Indiana, Showing PLYMOUTH Locomotive Sharing Big in Road Construction

There's a Joy In Business Aside from Profit

This joy comes in letters from customers who say our product is right, and that they have bought, used, and are pleased.

The Fate-Root-Heath Co., Goshen, Ind., Oct. 2, 1922.
Plymouth, Ohio.
Gentlemen:

We have been using PLYMOUTH 6-ton Locomotives for the past two seasons on all our large road projects with unusual success.

For heavy duty hauling where a positive schedule of deliveries of materials to a paver are essential, the PLYMOUTH Locomotive has never failed us, so we are naturally PLYMOUTH BOOSTERS.

We have used PLYMOUTHS on all kinds of subgrade with equal success, and have had all extremes from Michigan sand to Indiana muck.

In delivering gravel to a gravel road job we used two PLYMOUTHS with twenty 1½-yd. Western dump cars on each. Somewhat of a load but they never failed.

Send your prospects to our work at any time. We work our PLYMOUTHS to the limit.

Yours truly,
RIETH-RILEY CONSTRUCTION CO.
By George A. Riley.

Ask for Bulletins

THE FATE-ROOT-HEATH CO., PLYMOUTH, OHIO

PLYMOUTH
Gasoline Locomotives

Rock Products

Volume XXV | Chicago, November 4, 1922 | Number 22

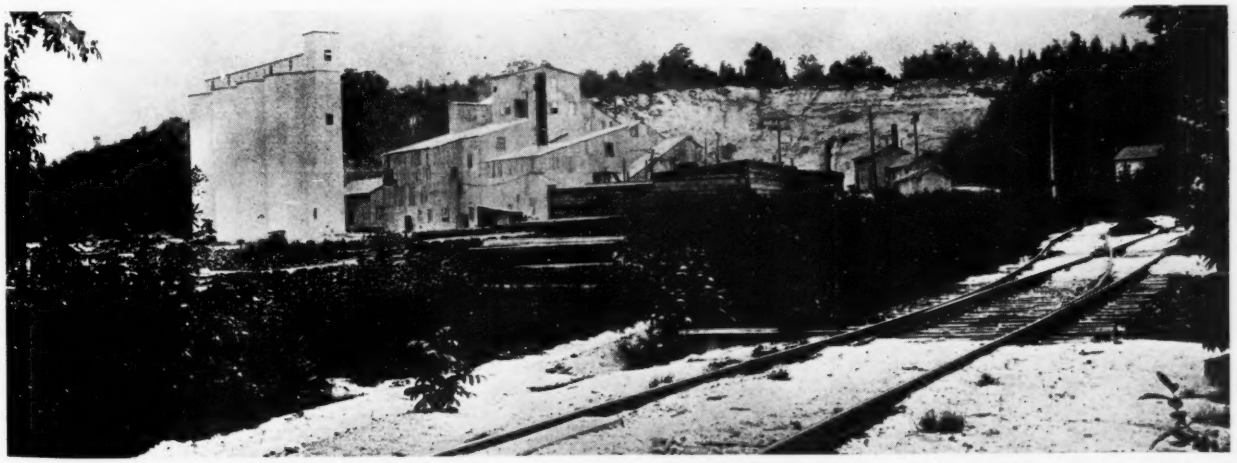
This Stone Plant Is a Model of Efficiency and Economy

By Charles A. Breskin

The recently completed stone-crushing and pulverizing units of the Limestone Products Corp. of America, Newton, N. J., are without precedent. Reinforced concrete storage tanks for pulverized limestone are among the many new and special features of operation and equipment

THE crushed and pulverized limestone industry has undergone considerable development in the last 10 years. Once crude and inefficient, it is rapidly developing to a highly scientific industry; from a hand to a completely automatic operation, no hand touching the material from the time it is blasted down in the quarry until it is loaded into cars. This is particularly true of the manufacture of pulverized limestone. The uses of this material have expanded materially, and naturally the demands as to its physical and chemical characteristics have become more exacting. Thus of necessity the industry has undergone a complete metamorphosis.

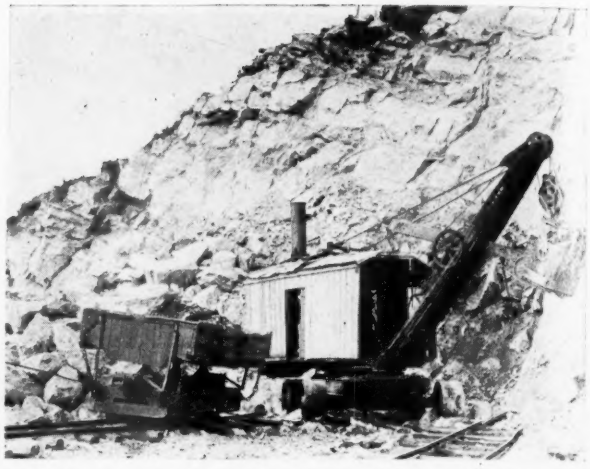
What is probably the country's most remarkable crushed and pulverized limestone plant, from the standpoint of efficiency and economy, is the recently completed plant of the Limestone Products Corp. of America, located at Newton, N. J. This plant typifies the real progress made by the entire industry —an entirely automatic operation, only five men being required to operate the machinery in the crushing and pulverizing units with a total capacity of 2000 tons per 10-hour day; a foolproof operation, with every available facility for storing and packing; a plant so constructed that it is possible to double or triple its capacity without injury or interruption to the operation of the original unit; a plant with 100 years' supply of high-grade stone and having characteristics that make for economical and efficient operation — a plant that is the direct result of experience.



This general view of plant was taken at the switch points. The spur track leads from the plant to the main line of the Lehigh and Hudson River railroad. Loaded cars from the plant gravitate to the main line

This corporation controls one of the most desirable limestone properties in New Jersey by a 99-year lease. The deposit is at Lime Crest, which is five miles from Newton, the seat of Sussex county. It is not a new deposit, having been worked as far back as 1906 by the Edison Portland Cement Co., and was then known as Crestmore. It is also interesting to know that the Edison Portland Cement Co. was the pioneer of the pulver-

Quarry floor and face showing the exposed length. The face is gradually being lengthened to make possible well-drill operation for blastholing. A Fordson tractor is used for haulage



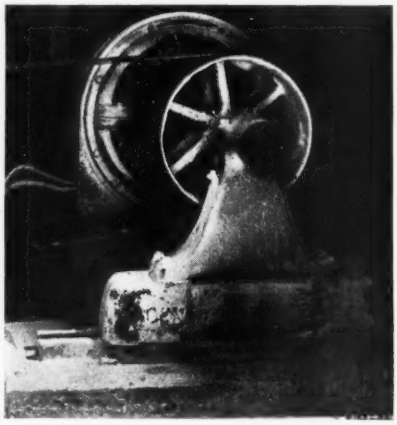
This 40-ton steam shovel loads the blasted limestone in 6-yd. side-dump cars. The dipper has 1-yd. capacity. Another 60-ton caterpillar shovel, with 1½-yd. dipper, will be in operation shortly

ized limestone industry in the United States.

President Edward S. Bixler, who conceived the corporation, was associated with the Edison Portland Cement Co. when it worked the deposit at Crestmore. During 1906 and 1907 the Edison company excavated approximately 280,000 tons of stone. This was shipped to New Village, N. J., for cement-making. Then the freight rate became excessive and with the high royalty that was paid it became necessary for the Edison company to abandon this deposit. After two years' prospecting the company finally located a deposit at Oxford Furnace, N. J. Here they manufactured 150,000 tons of pulverized limestone yearly, but after a short time they had to give up this profitable business because it was necessary to conserve the stone for use in the manufacture of cement.

In the meantime the deposit at Crestmore lay dormant from 1908 to 1919, due to legal litigation between the quarry lessees and the estate owning it. Mr. Bixler—he had served 19 years with the company, his final position being assistant to the president—had seen the pulverized limestone and fluxstone business grow into mammoth proportions. Knowing the possibilities that lay in this Crestmore deposit and while the litigation was going on, Mr. Bixler secured this deposit and organized the Limestone Products Corp. of America.

How this company was organized and financed would make a long story. Suffice it to say that Mr. Bixler gathered about him men who had devoted their lives to the stone business, the nucleus of an organization. He then went to Newton, a total stranger, and under adverse conditions succeeded in incorporating his company for $1,500,000 with the help of a few influential local men. Today, 90 per cent of the stock is owned by the people of Sussex county. That this plant is a model of efficiency and economy is the result of patience, painstaking effort, and fidelity to



A 150-hp. slip-ring motor, with three bearings and a unified base plate, is belt-connected to the gyratory crusher

purpose and the aim and desire to have the most modern and efficient limestone plant in the country.

Before the plant was built Mr. Bixler visited every stone and cement plant of note in the United States. He studied conditions and operations, carefully picking out the good things and profiting by the "other fellow's" experience. He then secured the best engineer he could get and incorporated the telling points of other plants in his own design. Thus the plant of the Limestone Products Corp. of America is not the fancy of a dreamer; it is the experience of the crushed stone industry concentrated in one operation, taking into consideration the local conditions.

Character of the Deposit

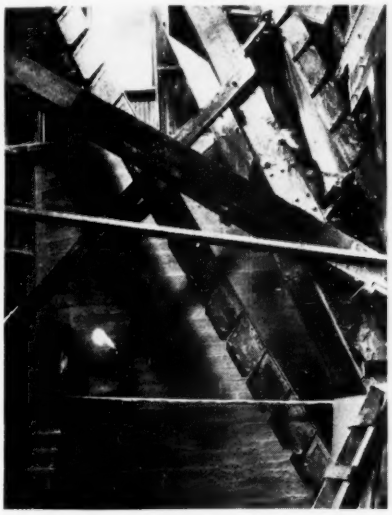
The plant and quarry are on the Lehigh

This No. 10 Gates gyratory crusher does the initial crushing. The loads from the 6-yd. cars are side-dumped into it. The crusher can handle 2000 tons per 10-hr. day. In the primary crushing building over the crusher is an air hoist and chain block

and Hudson River railroad, a 100-yd. spur track connecting the railroad and the plant. The deposit covers 38 acres of ground and is of a highly crystalline structure, practically a pure calcite, with the following chemical analysis:

Calcium carbonate	$CaCO_3 = 95.93\%$
Magnesium carbonate	$MgCO_3 = 2.71\%$
Silica	$SiO_2 = 0.34\%$
Iron and alumina	$Fe_2O_3 + Al_2O_3 = 1.4\ \%$

The deposit stands well above the quarry working level at an average height of 70 ft. and the face has been opened up to a length of 1500 ft. The rock structure—a succession of layers pitching at an angle of from 30 to 35 deg. from the horizontal—



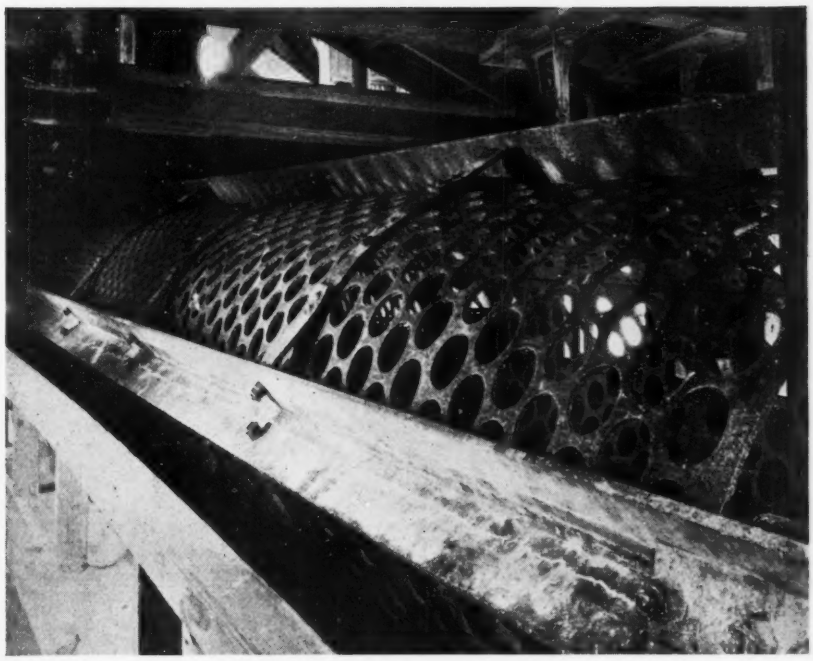
The stone discharged from the primary crusher is reclaimed by this elevator with 36x12-in. buckets mounted on a rubber belt of 70-ft. centers. The elevator is run by a 25-hp. squirrel-cage motor

reveals that less than 5 per cent would have to be rejected to maintain uniformity. Geologists have estimated that there is fully 10,000,000 tons of rock above the quarry surface, and if it is worked 160 ft. below the present working level, then, conservatively estimated, there is an additional 30,000,000 tons.

As the quarry opening is on the side of a hill, there are excellent drainage facilities and therefore the stone carries a minimum amount of moisture at all times. The drainage leads to a small creek about 400 ft. distant from the present working face.

Quarry Operations

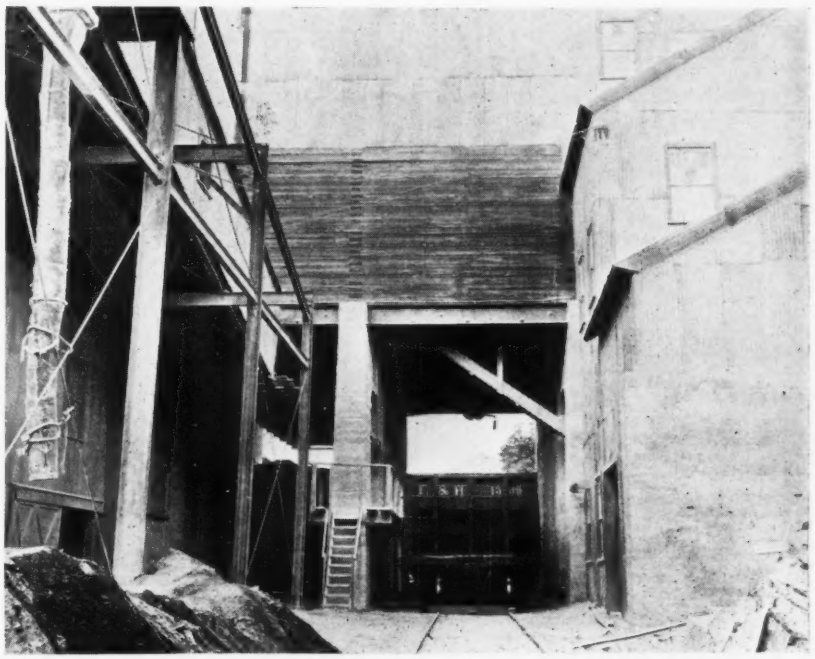
The overburden, barely averaging 6 in., consists of a very fine loam and vegetable matter. At the time of the writer's visit (September, 1922) hydraulic apparatus was being installed for the removal of this material. This apparatus consists of a 6-in. Worthington duplex plunger pump which delivers water to the suction nozzle at 75 lb. pressure. The main water supply is taken from a creek about 100 yd. from the quarry face by a 3-in. Cameron centrif-



The sizing of the stone is done in this 5x24-ft. rotary screen. It has four sections, with quick removing screen plates, so that the output can be changed to sizes to meet trade requirements

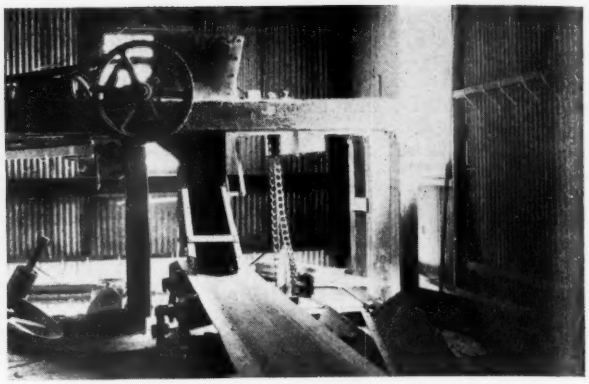
ugal pump belt-connected to a 25-hp. squirrel-cage motor. This pump delivers the water to a 3000-gal. reservoir on a hill 80 ft. above the quarry level. The plunger then takes the water from the reservoir and pipes it about 1000 ft. to the point of stripping.

Due to the small overburden, about one week's hydraulic operation will clean enough stone for two years' operations. As the stone has a good slope it makes an excellent runoff for the water carried to the creek. This method of stripping leaves no exposed pipe or overburden to contend with



Car loading tracks for flux and pulverized limestone. The bins overhead are of 1600 tons capacity. The fluxstone is loaded at the right. Underneath the pulverized limestone bins is a covered conveyor gallery which carries stone to the drier bins

This 18-in. belt conveyor of 75-ft. centers goes under the pulverized limestone bins and carries the rock to the drier bins



A transfer tower takes the material from the main conveyor and deposits on this short conveyor which discharges to the drier bins

during freezing weather for as soon as a considerable portion of the quarry is stripped the hydraulic apparatus is dismantled.

The quarry face is being worked semicircularly and because the face length is not sufficient to allow for economical well-drill operation a battery of Jackhamers are used for drilling. Holes are drilled to a depth of 20 ft. and 40 per cent gelatine dynamite is used for primary shooting; for block-holing, 20 and 30 per cent gelatine dynamite. The quarry face gradually being extended, it will, in a short time, reach a sufficient length to allow well-drill operation for blast-holing and bigger shots will follow, thereby resulting in less block-holing and consequently greater efficiency and economy will be had.

At present the rock is loaded into 6-yd. Easton side dump cars by a 40-ton Marion full revolving traction steam shovel, with a 1-yd. dipper. As this shovel has hardly enough capacity the company will install another 60-ton Marion caterpillar traction shovel with a 1½-yd. dipper. After loading the cars are hauled to the crushing plant by a four-ton Fordson tractor with a Brookville locomotive attachment. The short haul is made quickly over 36-in. gage tracks of 40-lb. rails.

The Crushing Plant

The cars are hauled to the crushing plant and dumped in a No. 10 Gates gyratory crusher, the receiving hopper of which is on a level with the quarry floor, thus eliminating all inclines. The crusher which reduces the stone to 6-in. size has a capacity of 2000 tons per 10-hr. day; it is belt-connected to a 150-hp. slip ring motor having an outboard bearing. Above the crusher is a Whiting air hoist which is used for turning over the extra large pieces of stone. There is also a Yale & Towne spur-geared chain block for use in rebabbitting the crusher or for repair work.

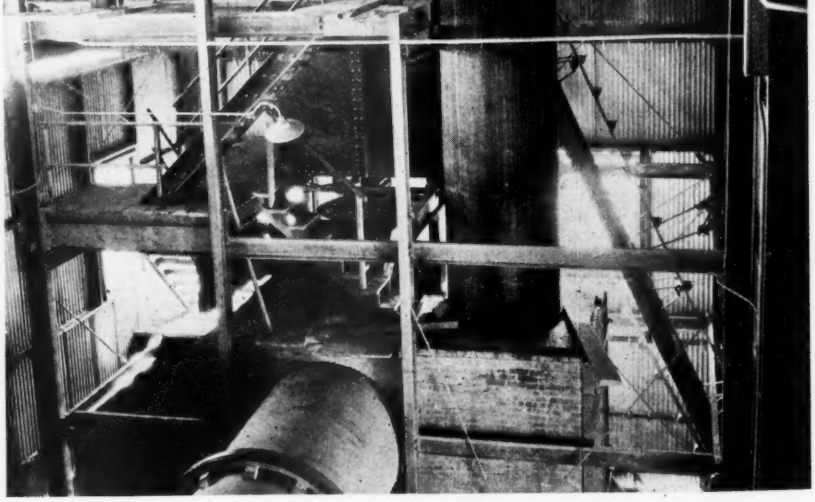
The 6-in. stone from the crusher is reclaimed by an elevator with 36x12-in. sheet steel buckets mounted on a Manhattan rubber belt of 70-ft. centers. The elevator is belt-connected to a 25-hp. squirrel-cage motor and discharges the stone to a 5x24-ft. rotary screen connected to a 20-hp. squirrel-cage motor. The four-section screen has quick removing screen plates so that the output can be quickly changed to fill orders promptly and in the desired sizes. The sections take screen plates from ½ to 4½ in.

The first section of the screen is fitted with a 3x6-in. angle-iron ring located 4 ft. from the feed end. Another 3x4-in. angle iron ring is placed at the lower end of this same section, thus insuring that all fines will go through the first section; it has also materially increased the screen capacity besides making a more thorough screening. The oversize is returned to the initial crusher while the fines go to four double bins below and one on each side of a screen section, making eight bins in all, with a total capacity of 1600 tons.

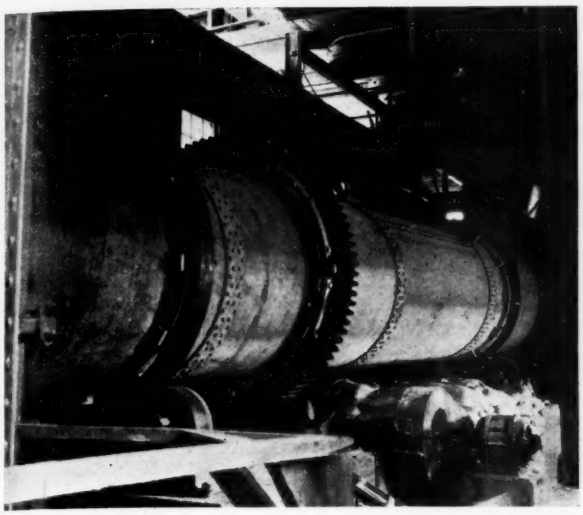
Underneath one set of four bins is a standard-gage track on which are loaded gondola cars for the fluxing stone trade. The other four bins contain stone for the pulverized limestone department. The bins are constructed of timber, log cabin style, and are sufficiently above the railroad track to facilitate easy loading. Car-loading for fluxing stone is controlled through Weller bin gates. An arrangement is provided whereby the entire capacity of eight bins may be diverted for the fluxing stone trade or to the pulverized limestone department.

Pulverized Limestone Department

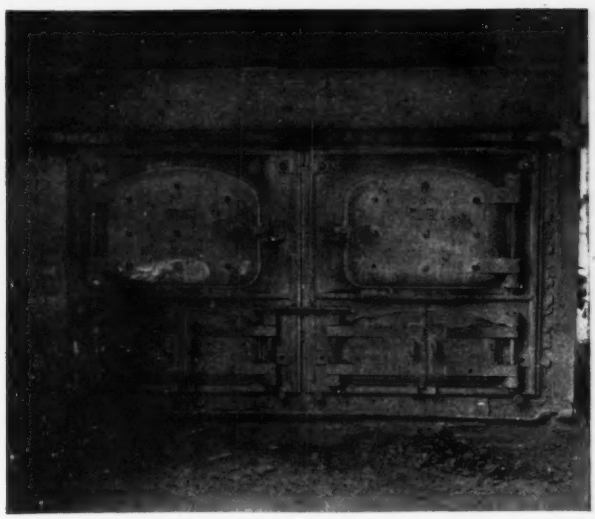
The four bins containing material for the pulverized limestone department may be tapped through three Weller reciprocating



The steel hopper-bottom drier feed bin has 25 tons capacity. A table feeder puts the material into the drier, the feed end of which is shown



A 5-ft. 6-in. x 40-ft. rotary drier set at an inclination of ¾ in. per foot, dries the stone. The rock is subjected to the heat coming in the opposite direction to the flow of the material



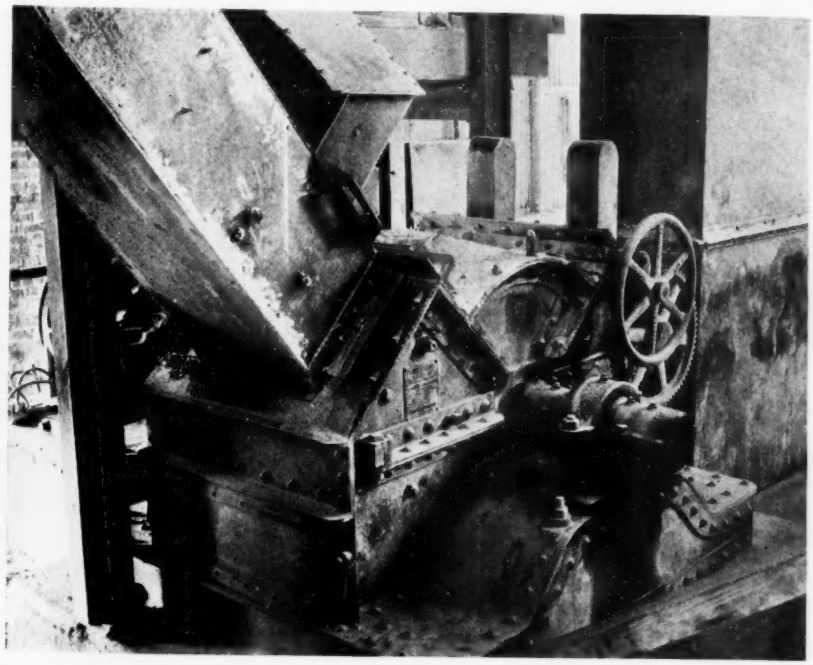
This is the fire box rotary-drier. It is really a double furnace and can accommodate an extra drier

feeders geared to one line shaft run by a 5-hp. squirrel cage motor. The tapped material is fed to a belt conveyor 18 in. wide, 75 ft. between centers and connected to a 10-hp. squirrel cage motor. The conveyor carries the screenings to a steel hopper bottom bin of 25 tons capacity ahead of the rotary drier.

The material from the bins is discharged to a Bethlehem rotary drier through a table feeder mechanism. This direct-fired drier is 5 ft. 6 in. in diameter by 40 ft. long. The passing rock is subjected to the heat coming in the opposite direction to the flow of the material and all traces of moisture are eliminated. This drier has a double furnace, so that an additional unit may be installed at any time. It is operated by a 15-hp. motor through a Link-Belt silent-chain drive, is set at an inclination of ¾ in. per foot, and has a 30-ton per hour capacity.

After passing through the drier the rock drops into a steel-enclosed chain bucket elevator of 40 ft. centers. The elevator has 7x14-in. malleable clasp reinforced lip buckets which discharge to a 25-ton steel hopper bottom bin also equipped with an adjustable table-feeder arrangement. This bin is directly above and feeds a Pennsylvania hammer mill which reduces the rock to go through ⅛-in. mesh.

An arrangement is provided whereby rock can be spouted direct from the crusher bins to the hammer mill. This is done only when the stone is dry; normally, it carries from 3 to 4 per cent moisture. The hammer mill is direct-connected to a 100-hp. motor operating at 925 r.p.m. The product is then reclaimed by a bucket elevator, an exact duplicate of the drier elevator, and is spotted by gravity to a 25-ton hopper bottom steel bin ahead of the compartment tube mill.



A hammer mill takes the product from the drier as well as from the limestone bins and reduces it so that all will pass through ⅛-in. mesh

The Compartment Tube Mill

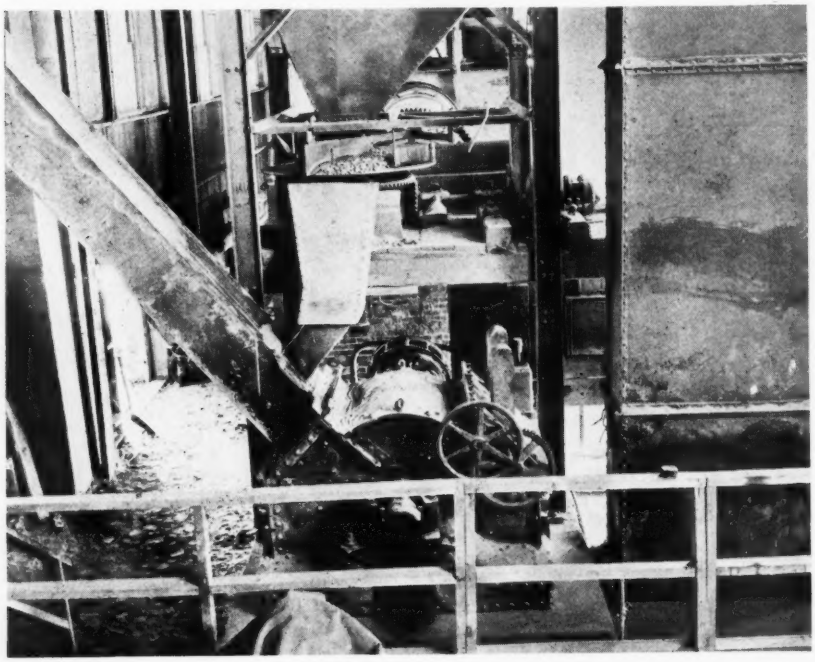
The material is fed into the compartment tube mill through a specially designed variable speed screw conveyor feeder. This 5½x20-ft. tube mill is driven through a set of gears by a 22-in. silent chain drive connected to a 200-hp., three-bearing, unified base plate slip ring motor which operates the mill at 22 r.p.m. The mill itself, an ordinary tube mill, was rebuilt by placing a manganese steel partition 4½ ft. from the feed end, followed by a blind partition, with lifter plates between to again discharge the material into the second compartment near the axis of the mill.

The first compartment is loaded to the center line with 1½-in. chilled steel balls. The corrugated grinding plates in this end are made from steel similar to the Krupp formula. The second compartment or finishing end is loaded to the center line with ⅞-in. chilled steel balls, 1¼-in. balls being used for replacement. This compartment is lined with the corrugated type Fuller-Lehigh chilled iron grinding plates. The compartment tube mill so grinds the stone that 75 per cent will pass through a 200-

mesh screen; it has a 20-ton per hour capacity. Due to the fine product received from the hammer mill, this compartment tube mill was installed without an air separator, but the building was so designed that the separator can be easily installed

siderable heat has been generated in the grinding processes; there has also been heavy loss through leakage in addition to the expense resulting from uneconomical handling.

After mature deliberation it was decided



View of the hammer mill showing the spout from the dried-rock and the limestone bins. Note the table feeder on the dried-rock bin. The hammer mill is direct-connected to a 100-hp. motor operating at 925 r.p.m.

should an especially fine ground product be required. The grinding room has been designed to allow of any number of additional mills by a small addition to the building.

The Storage Bins

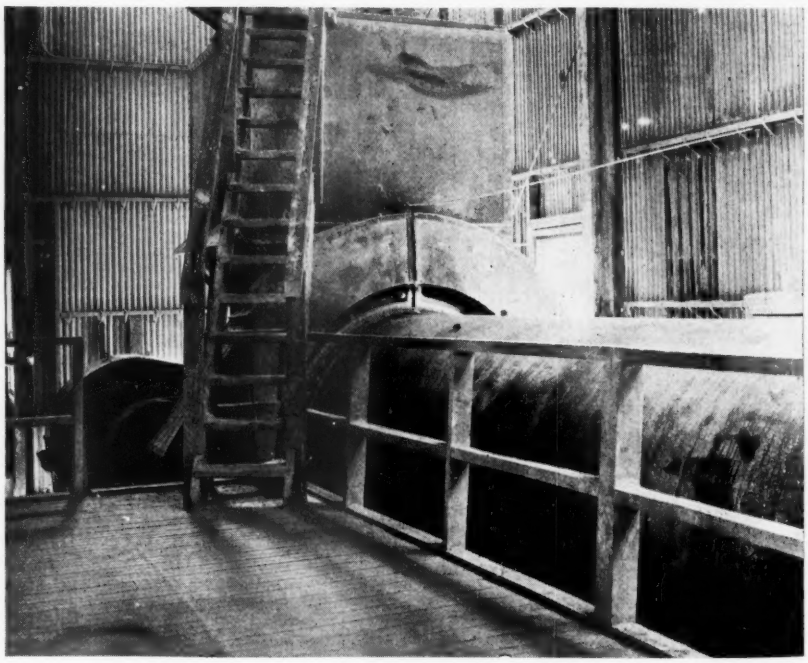
When the finely ground material leaves the tube mill it is discharged to a 14-in. screw conveyor set at right angles to the mill and housed in an underground concrete trough. This conveyor discharges to a steel enclosed chain elevator equipped with 7x14-in. malleable cast reinforced lip buckets and is in the stockhouse machinery well. It is 100 ft. between centers and discharges to a 14-in. screw conveyor, also housed in a concrete trough, supported on concrete piers and located on top of the silos forming the stock house.

Provision for suitable storage facilities was given very careful study as it was felt that in a large number of plants of like nature there is far too much waste in the handling and rehandling of the finished product. In most cases, a stockhouse consists simply of a single large bin, or a number of bins arranged in aisles, with conveyors for removing the material. These bins are generally of wood construction, therefore the fire risk is serious as the products are stored immediately after con-

to build a stockhouse consisting of circular bins, constructed of reinforced concrete. The contract was placed with the Bland Engineering Co. of Minneapolis, the building being designed by its engineers and planned as a practically self-operating unit. The structure consists of four circular bins, each 33 ft. in diameter and 75 ft. high, with a machinery well approximately 12 ft. square at one end, a conveyor gallery above the bins and a reclaiming tunnel beneath. The well contains a receiving elevator and a reclaiming elevator which discharges to a rolling screen, feeding to a conveyor, through which it passes to the Bates packers. The lower conveyor is driven by a 20-hp. motor and the reclaiming elevator, rolling screen and packing-machine conveyor by a 25-hp. motor. The upper conveyor is driven from the head shaft of the receiving elevator, which is driven by a 25-hp. motor. All motor starters are placed on the ground floor, and the limestone products can be placed in storage or withdrawn at any time from the bins to the packers with but little attention by the plant operatives.

How the Stock House Is Constructed

The bin walls have a uniform thickness of 8 in. from bottom to top and are reinforced by 2x⅜-in. flat steel hoops for the first 30 ft., 1½x⅜-in. for the next 20 ft., 1x⅜-in. for the next 15 ft., and ⅝-in. bars for the balance. The hoops consist of three bars with the ends lapped sufficiently to develop the full strength of the hoop; the



This 5½x20-ft. compartment tube mill pulverizes the material so that 90 per cent of it will go through a 100 mesh. It has two compartments—the first loaded to the center line with 1½-in. chilled iron balls and having corrugated grinding plates; the second has ⅞-in. balls with corrugated chilled iron grinding plates

laps are staggered. Vertical reinforcement consists of twelve 1-in. bars to each bin, with ⅜-in. bars about 2 ft. apart between. The formula for computing both horizontal and vertical wall stresses is dependent upon the angle of repose of the materal to be stored, the friction of the material upon the bin wall, the weight per cubic foot of the material, and the hydraulic radius of the bin.

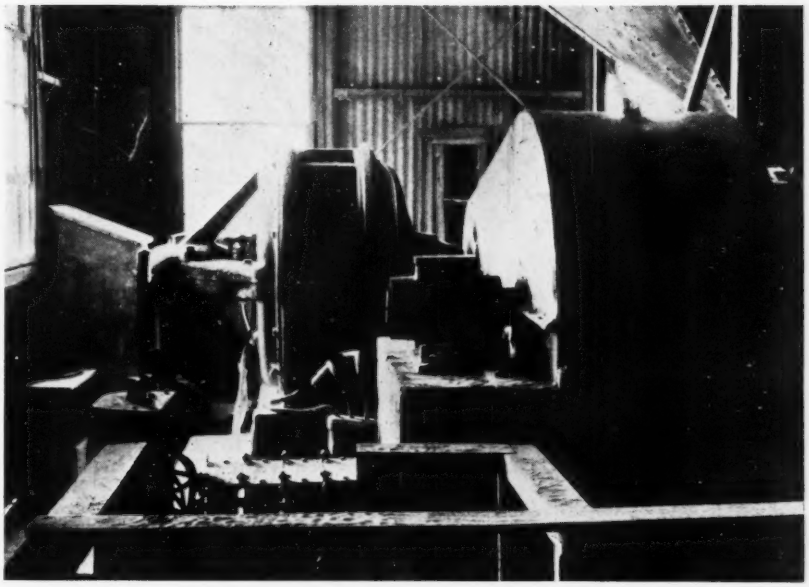
The bins and machinery well are founded on footing courses, and were built simultaneously by means of sliding forms. The tunnel was constructed after the bin walls were poured to a height above the top of the tunnel.

The forms for the walls were of wood 4 ft. high and the timber yokes were spaced about 10 ft. apart. These yokes were fastened to the form ribs and contained hollow jackscrews. Passing through the jackscrews were the 1-in. vertical reinforcing bars. Automatic gripping dogs were provided so that when the screws were turned in one direction the form would be lifted, and when turned in the opposite direction the jack would raise, the form being supported by the adjacent jackscrews. The forms are raised about 16 in. before reversing and raising the screws. After the forms were completed and the timber yokes were in place, trusses were built and the entire form decked, thus providing a working platform during construction and forms for the roof slab. In operation, the jacks were raised continuously over the whole building, extreme care being taken to keep the forms level. At the same time the concrete and steel were placed the concrete was carefully spaded to give a non-porous wall with a good finish. Construction proceeded at the rate of about 6 ft. per 24 hr. and was continuous from bottom to top.

As fast as the wall was released by the forms the rough places were patched by workmen on a scaffold hanging from the forms and the entire building treated to a coat of cement, sifted sand, hydrated lime and water, mixed to the consistency of cream and rubbed in with a wooden block. As soon as the top was reached the jacks and timber yokes were removed and the holes in the deck patched. The roof slab was poured upon this deck and the conveyor gallery built. This reinforced-concrete gallery is 10 ft. wide and 8 ft. high.

As soon as the bin walls had progressed sufficiently, the tunnel was constructed through the bottoms of the bins. The roof tunnel is a heavy slab as it supports the material in the bins. The space at the tunnel sides was filled with sand and a 6-in. concrete floor laid. The floor slopes toward the draw-off openings, of which there are four to each bin, in the tunnel walls.

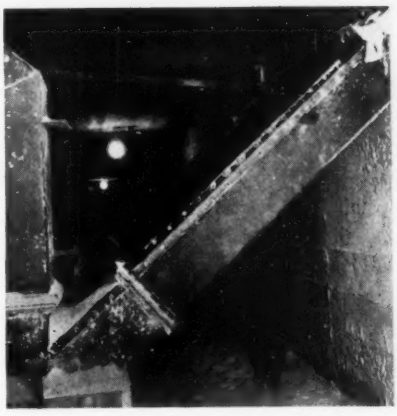
The conveyor gallery is well lighted by standard Truscon steel sash, glazed with



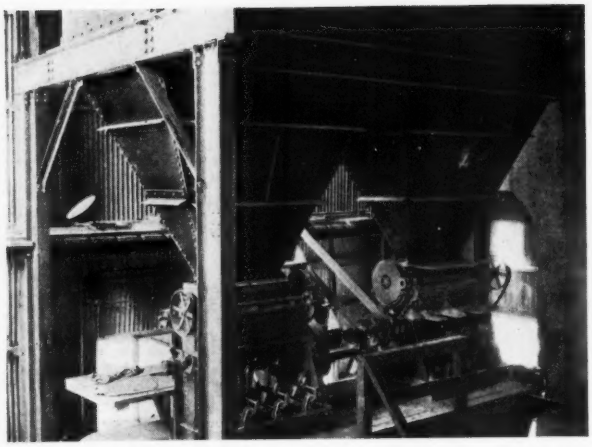
A 200-hp. motor with outboard bearing drives the tube mill at 22 r.p.m. through a 22-in. silent-chain drive

The 3000-ton storage for pulverized limestone is composed of these four reinforced-concrete storage bins; they are 75 ft. high and 32 ft. in diameter. A machinery mill is provided for elevators and main lift and there is a distributing and reclaiming screw conveyor

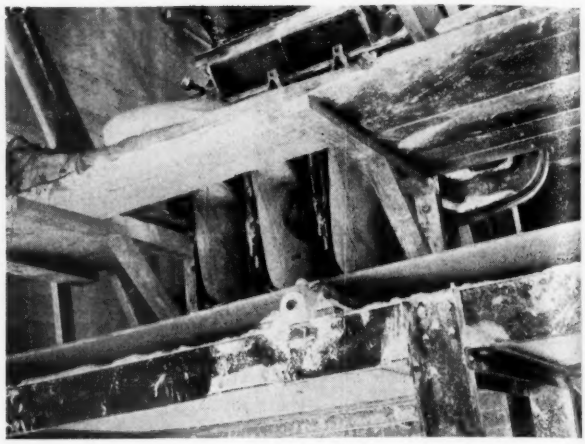
The headhouse of the stock bins, in which is the screw conveyor running in a concrete trough, delivering limestone to bins at four points, filling 95 per cent of the maximum capacity of bin



A tunnel underneath the stock house contains a screw conveyor which reclaims the material and delivers it to a bucket elevator which carries it to the packing department

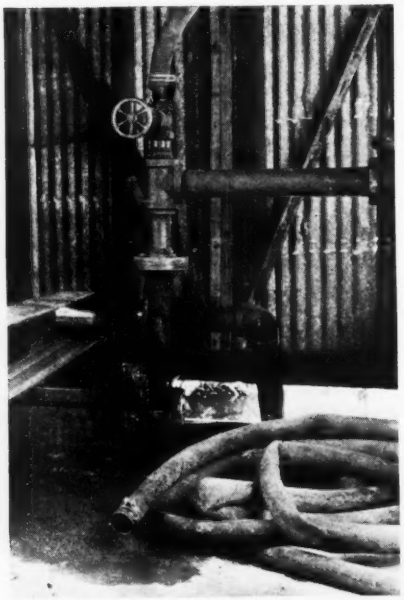


The pulverized material is packed by two three-spout valve bag packers. The operator sitting on a raised platform allows the bagged material to fall on a belt conveyor which carries it direct to the cars for loading. The packers have a combined capacity of 500 tons per 10-hr. day.



Platform on which the packer operator sits. The conveyor below is reversible and carries sacked material to one side of the plant for car loading and on the opposite side for truck loading

ribbed wireglass, and is readily accessible through a manlift, installed in the machinery well. This manlift is a cage about 30 in. square, counterbalanced to the weight of a man and running in guides from the ground to the gallery floor. A pull on the soft cotton hand line passing through the cage from roof to floor will move the cage either up or down. The counterweight is balanced to the weight of the car and of the man who customarily operates it, so that slight pull only is necessary to overcome the friction of the roller bearing in the hub of the sheave over which the counterweight cable passes. A man can go from top to bottom with perfect safety in a few seconds. In addition to foot brakes a safety brake operates automatically if the cable breaks. A steel ladder is also provided in addition to the manlift.

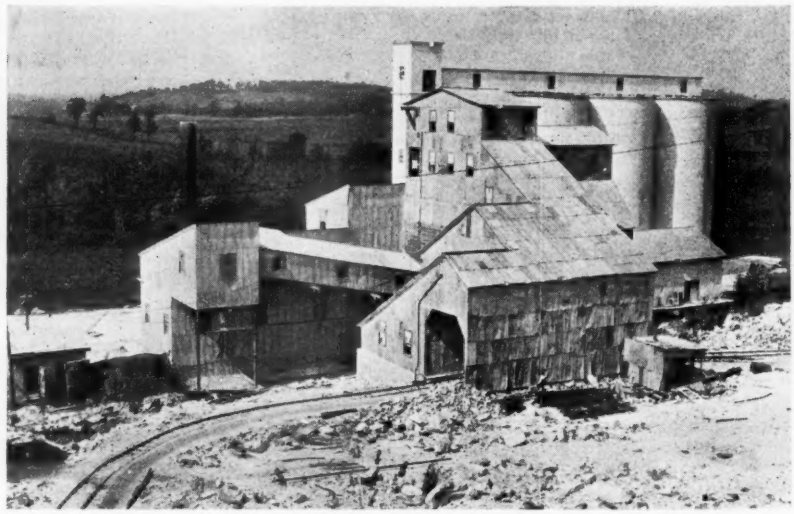


This 3-in. centrifugal pump supplies the water for hydraulic washing as well as for general plant needs. It is belt-connected to a 25-hp. motor

The outer bins coating was given particular care so that it has a very smooth, even surface. The nature of the mixture has given a clear white finish to the walls of the building; it is very beautiful, the effect being heightened by the glazed porcelain tile sign with large letters set in the concrete on one side of the conveyor gallery.

The screw conveyor in the stockhouse top gallery discharges at four points to each silo so that 95 per cent of the maximum capacity of the silo is filled. The total silo capacity is 12,000 tons, the silos being arranged for indefinite expansion.

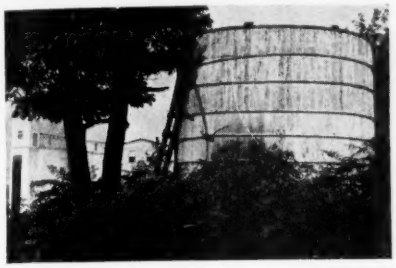
Material from the silos is drawn out at four points into a 14-in. screw conveyor underneath the silos and discharges to a steel enclosed chain bucket elevator of 30-ft. centers which carries the material to a 14-in. x 10-ft. revolving screen having ¼x2-in. perforation and entirely enclosed in a steel jacket. The oversize and foreign material discharge through a tailing spout into a waste pile while the fines are carried by a 14-in. screw conveyor running in a steel trough to two steel hopper-bottom bins of 20 tons capacity each and located over two Bates three-spout valve bag packers.



This entire plant, excepting the rock storage bins, is constructed of concrete and steel, with corrugated iron roofing and siding, making it fireproof throughout. It's a beauty, isn't it?

Packing and Loading

The pulverized limestone is packed in both cloth and paper bags, 80 lb. to each sack, the Bates system for filling and closing bags being used. All cloth bags are tied with Bates upset end wire ties on helical gear bench tying tools. All the paper bags are of the Bates patent. Two three-tube Standard 1922 model packers have been installed. These machines are belt driven, a separate 15-hp. motor being used on each, giving said machine a speed of 1050 r.p.m.



The 3000-gal. reservoir is on a hill 80 ft. above the quarry level. It supplies the water for hydraulicking the overburden

After being automatically filled and weighed on these machines the bags are discharged on a conveyor belt, which takes the bags directly into railroad cars, where they are trucked on two-wheeled trucks and piled according to the quantity desired. This reduces the trucking distance to one-half the inside length of the box car. The conveyor belt which carries the bags from the machine has a speed of 150 ft. per minute and is equipped with the Bates standard belt and discharge, which includes live roller, slide and apron, made from sheet steel and adjustable so that it can be raised or lowered to any height to suit conditions in various types of box cars. This conveyor belt is driven by a separate motor and is reversible, and on the opposite end is a chute for loading trucks and teams.

These packers have a capacity of 30 tons each per hour. This installation is capable of packing 500 tons of pulverized limestone per day of 10 hr., and requires but four men to operate, one man on each packer and two men in the car to store the filled bags. Ample provision has been made for taking care of the small spill from these machines; a hopper inside the foundations supporting these machines carries the spill directly into a screw conveyor beneath these foundations and this screw conveyor returns the spill to the elevator which carries it to the revolving screen, where it passes through and is conveyed back to the bin over the packers. Thus practically all the spill is removed from the machines and returned to the bins over the packers.

Provision has also been made for loading bulk in cars. A pipe has been connected to the conveyor over the packing bins which leads directly into the cars which facilitates the handling of this material and makes the operation simple. All the bins and conveyor frames and supports are of steel construction. One feature of this installation is that each unit is driven by a separate motor, making it convenient and economical to operate.

Power and Machinery

The plant is electrically operated throughout, the current being purchased from the New Jersey Power and Light Co. It is carried over a high-tension line into the transformer station adjoining the mill at

To the left Edward S. Bixler, president of the Limestone Products Corp. of America. At his right is Chester J. Pegg, the superintendent

The men who operate the entire plant. Two are required for the pulverizing department, three for crushing, three for shop and maintenance work. The rest are kept busy around the plant

33,000 volts and is stepped down to 440 volts, three-cycle, six-phase, at which current all the machinery is operated. From the switchboard the lines run direct to their respective motors. Thus, all the electrical energy used at each motor is measured and the plant operated along the most efficient lines from a power consumption standpoint. All of the motors are of the G. E. heavy duty type.

The No. 10 Gates crusher, reclaiming elevator and rotary screen were furnished by the Allis-Chalmers Co.; the compartment tube mill was rebuilt and extra material furnished by the Bethlehem Foundry and Machine Co., as well as the rotary drier; the hammer mill by the Pennsylvania Crusher Co.; elevators and casings by the Link-Belt Co.; bag packers by the Bates Valve Bag Co., Chicago; bin gates by the Weller Mfg. Co.; steel erection and fabrication by the Belmont Iron Works; table feeders by W. E. Mosser & Son.

Compressed air for the quarry drills and air hoist is supplied by an Ingersoll-Rand horizontal belt-driven air compressor. It furnishes 475 cu. ft. air per minute and is driven by a 75-hp. slip ring motor.

On the mill site is a separate building for a general repair shop; one for storing oil and grease; a powder magazine; an automobile garage, an employes' rest room and a superintendent's office. A separate building is also provided for the pump house. Only 25 men are required for the entire operation. The pulverizing department—which includes belt conveyor, rotary drier, hammer mill, tube mill, elevators and conveyors—is operated by two men, and during the night shift only. For the crushing plant only three men are required; for shop and maintenance work, three more men, with 17 men around the quarry, etc., making 25 men for the entire operation.

With the 100-yd. spur track leading from the plant to the railroad, the loaded cars go by gravity from the plant to the main line. The Delaware, Lackawanna & Western and the Erie railroads are also in close proximity to the plant, therefore the company is wonderfully fortunate insofar as railroad location is concerned. It is also close to New York and in the heart of a chemical and steel center, and thus strategically located with regard to its markets.

Personnel of the Company

Edward S. Bixler is president of the Limestone Products Corp. of America; E. Merriam Dutcher and Newman E. Drake, vice-presidents; William E. Horne, secretary and treasurer, and Chester J. Pegg, general superintendent.

Of Mr. Bixler, no more need be said. Liman Sandrock presents a pen picture of Mr. Bixler in the "Quarried from Life" page elsewhere in this issue. E. Merriam Dutcher is treasurer of the H. W. Merriam Shoe Co., Newton, N. J., and locally prominent, as is Newman E. Drake, who is president of the Drake Baking Co., of Brooklyn, N. Y. William E. Horne was formerly secretary and treasurer of the Edison Portland Cement Co., with whom he spent 12 years; prior to that time he was with the Bethlehem Steel Co. for 20 years. Chester J. Pegg started in the stone game in 1900 with the old Iola Portland Cement Co., at Iola, Kans. He served six years in Canada building and remodeling cement plants and two years in Guatemala, Central America. The rest of the time he was with various plants, his final position before joining Mr. Bixler's organization being with the Tidewater Portland Cement Co., Union Bridge, Md. Twenty-two years of experience in the stone industry is Mr. Pegg's record. The board of directors consists of the officers of the company, excluding Mr. Pegg, the only other director being Howard H. Leh, superintendent of the Phoenix Portland Cement Co., Nazareth, Pa. Sales Manager E. Meyer, who maintains offices at 26 Cortlandt street, New York City, was with the Edison Portland Cement Co. for 17 years and was manager of pulverized limestone sales.

To Howard H. Leh, who has been consulting engineer of the company since its inception, President Bixler pays high tribute. Mr. Leh has been engaged in the cement industry for nearly 20 years, and is now operating the Phoenix cement plant. The recent investigations carried on by the government developed that the Phoenix plant was not exceeded by any other Eastern plant in economical operation. Mr. Leh rebuilt that plant within the past four or five years.

Natural resources and strategy of location with respect to markets are such that the hydrated lime business, it would seem, would be a very profitable venture here, and while the company has made no formal announcements that it would erect a lime plant as yet, it may be expected sooner or later as a natural form of expansion.

It's Up to the Potash Producer to Make Good

THE domestic potash industry has been dealt a severe blow by failure to protect it from foreign competition in the new tariff act, but by careful management and reductions in costs it will survive and eventually develop health, in the opinion of Frederick W. Brown, secretary of the United States Potash Producers' Association.

Reports show that the Nebraska field is completely out of production. The Nebraska output, while low in salt content, formerly supplied approximately half of the United States tonnage. The only activity in that state at present is by one company which is sinking a well in hope of striking either oil or gas which would give cheap fuel and permit operation.

There are only three companies in general commercial operation for potash now, in contrast to the high record of 77, exclusive of wood-ash producers, in 1918, this figure declining to 18 in 1921. These three are the American Trona Corporation of Searles Lake, Calif., with potash deposits, and two byproduct plants; that of the Santa Cruz Portland Cement Co. of San Francisco, which produces from cement mill dust, and the United States Industrial Chemical Co. of Baltimore, producing from alcohol distillery waste. There are two, possibly three, other cement plants which are selling dust locally to farmers who bring their wagons to the plants.

While production is far below the war records, the potash now being produced is of much higher grade on the average than the war-time average. Despite conditions in the domestic industry, potash men are pushing ahead to develop their business in hopes of eventually being able to meet the German and French competition, probably by a combination of an increase in the price of the foreign product and a lowering of their own costs.

The core drill being sunk in west Texas to determine the stratum of the potash deposits known to exist over a wide section of that country is reported to be down about 900 ft. This potash is known to be comparable to the best German potash.

Mr. Brown expects a combination of the French and German potash interests and a considerable increase in their prices this year. The condition of the domestic industry is summed up by Mr. Brown in the phrase, "desperate, but not hopeless."

Ohio Sand and Gravel Co. Will Rebuild Its Plant

PLANS have been completed by the Ohio Sand and Gravel Co., Bellaire, Ohio, for rebuilding its present plant at Dillie. This is a pit operation, excavating by crane and conveying by skip cars and hoist. It has a capacity of about 300 tons per day of washed and screened sand and gravel.

The screening plant will be completely rebuilt, the revolving screens will be replaced by perforated gravity screens and the bin capacity will be increased proportionately. The boat to be built by the company will be equipped with a 12-in. suction pump, belt-driven by the latest type of oil burning engine. All material will be pumped direct from a pond to the screening plant, thus ensuring a minimum of handling.

The new operation will be constructed under the supervision of P. B. Dickson, president and general manager, and will operate under his direction upon its completion. When completed this plant will have a daily capacity of 1,500 tons. The cost of reconstruction will be near the $25,000 mark. It is expected that the plant will be completed about February 15.

New Cement Plant for Birmingham

IT is announced by the Dwight P. Robinson Co., Inc., 25 East Forty-sixth Street, New York City, that it has been awarded a contract for the construction of a cement mill at Birmingham, Ala., for the Lehigh Portland Cement Co., Allentown, Pa. The mill will have a capacity of 1,000,000 bbl. a year.

Position of Non-Metallic Minerals in the Mining Industry

Where the stone, gravel, cement, lime, gypsum and other non-metallic mineral industries stand today, and what they need to increase their efficiency over the present—in some cases rather antiquated—methods of operation

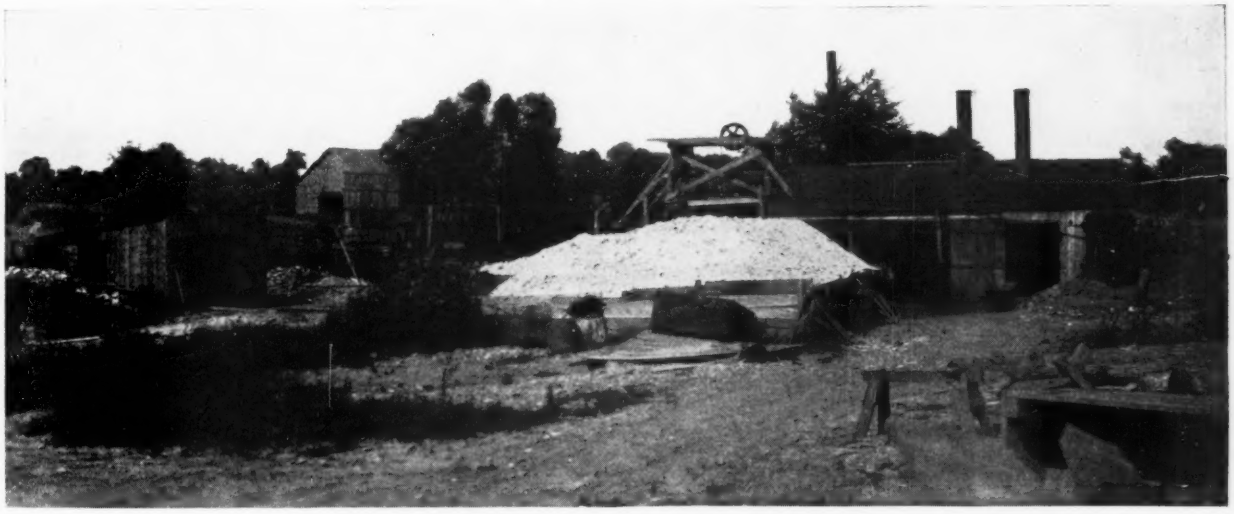
By Raymond B. Ladoo

AS THE term is now most generally used, the non-metallic mineral field covers the production of all minerals and rocks which are not used chiefly as sources of the metals; but it does not include coal, petroleum, or natural gas. The terms "industrial minerals," "economic minerals," "minor minerals," and "lesser minerals" have all been used to describe this field, but they all seem misleading and inadequate.

The metallic minerals galena, sphalerite, chalcocite, etc., are certainly "economic" and "industrial" minerals, but they have practically no non-metallic uses; and gypsum, the value of the annual production of which amounts to many millions of dollars, surely cannot be considered as a "minor" mineral. A number of minerals have both metallic and non-metallic uses and certain phases of the production of these minerals should be considered in both fields. Thus bauxite is the only ore of aluminum, but it is also used in the manufacture of abrasives, refractories, and aluminum salts. Pyrite is used chiefly in the manufacture of sulphuric acid, but after the sulphur is removed from pyrite by roasting, the residue is used in the manufacture of pig iron.

The non-metallic mineral field therefore includes such materials as sand and gravel, clay and clay products, stone, portland cement materials, gypsum, fluorspar, feldspar, slate, limestone and lime, graphite, fullers earth, potash salts, mineral pigments, refractories, abrasives, phosphate rock, barytes, asbestos, mica, and so on. In 1917 the estimated annual value of non-metallic mineral products, produced and imported for consumption in the United States, was between $800,000,000 and $850,000,000. No more recent statistics have been compiled, but it is probable that the total value in 1920 considerably exceeded a billion dollars. As further evidence of the great importance of the non-metallic mineral field it has been noted that the annual value of the non-metallic mineral products (exclusive of coal, oil, and natural gas) of Pennsylvania alone now exceeds the total value of *all* mineral products of such old mining states as Colorado, Utah, Missouri, Texas, Nevada and Idaho.

Mining and preparing the non-metallic minerals therefore forms a very important section of the mining industry, but unfortunately they have not received the attention of engineers and the mining public in general which their importance warrants. Few mining engineers have considered the production of sand and gravel, limestone and lime, gypsum, portland cement materials, clay, talc, feldspar, etc., as being a part of the mining industry. It is not surprising therefore that producers, consumers, and the public have been slow to realize the connection.



A typical surface plant and stock pile at a small fluorspar mine in southern Illinois

Metallic and Non-Metallic Mining Compared

If gold dredging can be considered mining, then sand and gravel production must be mining. If the huge open pits of the Mesabi iron range and if the porphyry copper mines of Bingham Canyon, Utah, and Santa Rita, N. M., are mines, then

surely cement rock and crushed stone operations must be mines. Furthermore, many of the non-metallic minerals are produced almost wholly from underground mines by methods almost identical with those used in metal mining. For example, in the large fluorspar mines of southern Illinois a very efficient system of shrinkage stoping is used.

In many instances the close relation between the metals and the non-metallics

Golding & Sons Co. operate this feldspar quarry at Georgetown, Maine

continues, through the methods of concentration, preparation for market, metallurgy, etc. In the milling of fluorspar, jigging and tabling are used to separate fluorspar from calcite, silica, galena, and other impurities. In the preparation of clay and ochre, classifiers, Dorr thickeners, and continuous filters are commonly employed. Oil flotation is used in the graphite industry. Tube mills and conical pebble mills are in common use in grinding feldspar, talc, quartz, barytes, etc. Elaborate and extensive systems of sizing by trommels and impact and vibrating screens are used in preparing sand and gravel, crushed stone, etc.

In the making of glass from glass sand, lime from limestone, portland cement from limestone and clay, and chinaware from clay, feldspar and silica, the methods—and often the equipment—are closely analagous to those used in metallugical processes. In fact, the technology of glass manufacture might indeed be called the "metallurgy" of glass sand.

Problems of the Non-Metallic Field

But, while these examples prove the right of the non-metallic minerals to a prominent place in the mining industry, there are important differences between the metallic and non-metallic mineral industries which must not be overlooked.

While there are only about 15 common metals, and in addition, possibly half-a-dozen important metals less commonly used, there are between 40 and 50 non-metallic minerals commonly mined, and over a hundred which are mined and used to some extent. In addition, there are often several varieties, types, and grades of each mineral which are mined and treated separately and sold for different purposes. Thus there are many different types of clay each adapted for a different use. Talcs used in the paper industry are not suitable for the toilet-powder trade, and fibrous talcs used in paint are not suitable for paper manufacture.

The ultimate object of metallic ore production is to recover the metals in a pure state; this usually involves chemical change in the metal bearing mineral. In mining therefore little or no attention need be paid to the protection of the ore from contamination by small amounts of impurities. But many non-metallic minerals undergo no chemical change from the mine to the finished product and in mining, transporting, and milling great care must be exercised that no deleterious impurities be introduced. Iron in any form is a harmful impurity in feldspar. Therefore, feldspar should not be shipped in steel cars and in feldspar grinding no ordinary iron or steel grinding surfaces are used. In talc used in the paper, paint, textile, and many other industries a pure white color is essential, and in talc mining care must be taken that mine water, carrying a high percentage of iron oxide from pipes, rails, etc., does not discolor the talc.

The value of some non-metallic minerals depends largely upon the structure of the mineral itself or upon the form in which it is removed from the ground; thus high-grade mica must occur in large clear, flat plates capable of being split into very thin, flexible sheets. Asbestos, to be of value for spinning purposes, must occur in long, fine, flexible fibres. In mining and treating mica and asbestos great care must be taken that the structure is not injured. Roofing slate must be cut and split into thin plates of definite size and frequently the finished slate constitutes only 20 per cent of the total slate removed from the ground. Structural marble and granite must be removed from the ground in large, sound rectangular blocks which can be sawed, turned, carved, and polished to definite and exact dimensions, thus in quarrying structural stone, account must be taken of such structual features as cracks, joints, faults, and so on.

Most of the metals, when finally obtained in a pure state, can be readily sold in the open market or at least can be stocked and used as collateral for loans. In many instances the market can be stimulated by a reduction of price or by an advertising campaign. Thus low steel prices may induce a period of construction activity. The advertising slogans, "Make It of Zinc" or "Make It of Copper" may greatly increase the market for zinc and copper. But many of the non-metallic minerals cannot be sold in the open market and their production and sale are dependent upon the condition of the industry in which they are chiefly used. Thus while feldspar is an essential in the manufacture of chinaware and porcelain, it is used in definite and more or less fixed quantities in that industry and neither a lower price nor an advertising campaign could materially increase that market. The principal mineral fillers used in paper are china clay and talc, but the sales of such paper fillers cannot be artificially stimulated by lower prices or by clever advertising. The demand for paper regulates the demand for paper fillers.

Possibly the greatest differences between the metallic and the non-metallic mineral industries are to be noted in their commercial or economic phases. Copper, lead, zinc, or silver ores may be mined, concentrated, smelted, or reduced at plants not far from the mines, and the metals sent to all parts of the world. But many of the non-metallic minerals occur in such relative abundance and command such low prices that markets are largely localized. In such industries production may assume many of the characteristics of ordinary manufacturing, and marketing becomes an important problem.

Producing Gravel, Stone, and Cement

Sand and gravel, and stone suitable for crushed stone are most widely distributed and, while their economic production involves—or should involve—the use of considerable engineering skill, the proximity to markets is most important and the problems of transportation, distribution and sales are paramount. Raw materials suitable for the manufacture of portland cement are much more widely distributed than is commonly supposed and portland cement is such a low-priced commodity

that high transportation charges are not justified. Therefore the most important consideration in the location of new cement plants is the proximity to and the size of important markets for cement.

The second most important consideration is usually the availablity of cheap fuel. The third consideration is the selection of the deposits of the raw materials. Pumicite, or volcanic ash, such as is used so extensively in the manufacture of abrasive cleansers, occurs in large deposits in several states. The most difficult part in the producing and marketing of such pumicite products therefore is not the finding of suitable deposits or the economical and efficient production of pumicite, but the wise selection of a trademark and the building up of a large demand by extensive, persistent, and clever advertising.

Where Engineering Attention Is Needed

Many of the non-metallic minerals are used as raw materials for the chemical industry or in industrial plants largely under chemical control. Limestone and lime are used in a great many chemical processes and common salt is the chief source of many important sodium salts. The rubber industry uses large quantities of clay, whiting, talc, and sulphur. In the manufacture of paint many non-metallic minerals are used both as pigments and as fillers. In the manufacture of portland cement careful chemical control is necessary in order to insure a uniform, high-grade product. The successful manufacture of glass, chinaware, porcelain and other ceramic products requires careful control by ceramic chemists.

Therefore the non-metallic mineral industries which must produce a chemically controlled product or whose products are used in industrial chemical processes, have received considerable attention from chemists and chemical engineers. In many cases, unfortunately, technical interest in the non-metallics has been confined to chemical phases. Mining engineers in general have given little attention to this field and many of the industries involved have shown little interest in obtaining engineering advice. Many examples have been noted where large cement and lime companies which produce high-grade, chemically controlled products, tolerate great inefficiencies in their quarries. In some of the smaller industries, such as feldspar and mica, these inefficiencies are often still more prevalent. The mining engineer, through his lack of interest, may be partly responsible for this situation, but other causes must be sought in most cases.

Reasons for Inefficiencies in Non-Metallic Industries

Abundance and widespread occurrence of many materials such as sand and gravel, limestone, clay, etc., has encouraged the starting of many small, scattered operations by people of small capital and little or no mining knowledge. In the course of time some of these develop into large and efficient units, while others struggle along for years eking out a precarious existence.

For some unknown reason those who control capital ordinarily interested in mining ventures have shown little interest in the non-metallic minerals in the past. Other capital, of course, has gradually become interested, but the valuable contact with the mining world in general has been lacking. This situation, fortunately, is gradually changing and several very large metal mining organizations now have non-metallic mineral interests. One of the best examples is afforded by the Anaconda Copper Mining Co. with its large and important phosphate rock mining operations in Idaho.

In many and perhaps most of the non-metallic mineral industries the operators are not mining men and employ no mining engineers and no real miners. In general, they do not attend meetings of mining men, and often do not even subscribe to mining journals. Such operators are completely out of touch with progress in mining and milling. Some of the simplest methods, machines, and devices everywhere in common use in the metal-mining industries are entirely unknown in some sections of the non-metallic mineral industries. For example, a feldspar producer of long experience was recently much surprised and perplexed at the use of flow sheets in a description of feldspar milling.

Not only is there lack of contact between the metallic and non-metallic mining industries, but in many cases there is almost as little contact between competing producers in the same industries. Secretiveness is still prevalent in some sections and the value of free and frank exchange of views has not been learned. Obsolete and antiquated methods are closely guarded as trade secrets.

But great progress is being made toward the remedying of this situation, principally through the formation of trade associations, through the work of technical societies, and by the efforts of such governmental agencies as the Bureau of Mines and the Bureau of Standards.

Getting Producers and Consumers Together

Another source of inefficiency and loss to both producers and consumers of non-metallic minerals is a lack of contact between them. In some industries it has been the custom to market greater or lesser proportions of their products through jobbers or brokers. Here the producer often does not even know the names of the consumers of his product and the consumers do not know the sources of their raw materials. This sometimes results in the consumer paying unduly high prices for material for which the producer received a low price or in his being supplied with a material of a grade or type inferior to that which might be obtained if the producer understood his requirements.

Another common source of misunderstanding between producers and consumers has been the lack of proper standards and specifications for many mineral products. Indeed, in some consuming industries chemists will frankly admit that they cannot accurately define their requirements and that the suitability of some raw materials can only be determined by actual mill tests. It is no great wonder then that in such cases producers have difficulty in always satisfying their customers.

Constant progress is being made, however. Many standards have been set up and many more are being developed. Portland cement standards are generally known and adhered to. Standard specifications for lime, gypsum, and gypsum products,

The typical method of working sedimentary kaolin. This quarry is in Langley, S. C.

paint materials, and so on have been formulated. Standard specifications for feldspar have been suggested and their preparation will probably be undertaken soon. Some standard specifications, however, will be very difficult to formulate, for the physical properties on which the uses of some materials depend are not well understood and no apparatus has been devised for their measurement. This applies particularly to materials such as clay, talc, whiting, and other finely pulverized materials used as fillers in paper, rubber, lineoleum, oilcloth, textiles, and so on. For paper fillers the most important qualities are pure white in color, high percentage of retention of the filler in the finished paper, and freedom from grit. Color may be measured with fair accuracy by several types of colorimeters, and the relative amount of grit can be approximated. But the percentage of retention can be determined accurately only by actually making up samples of paper. On clays, retention tests which give results fairly in accord with mill practice can sometimes be made, but these tests are entirely inadequate and misleading when applied to talc. Thus the problem of standardization in some cases may have to await the obtaining of additional knowledge through research.

Present Trend Toward Increased Efficiency

The non-metallic mineral industries are now passing through the stages of change and improvement, started in the metal mining industry years ago and more recently in the coal industry, but the different individual industries are scattered at intervals along the path of progress. The portland cement industry is highly organized and capable of solving its problems as they arise. Other industries have only recently been awakened and efficient operation is just being started by a few companies, while still other industries have hardly made a start.

In the present age of large scale operation one of the most obvious improvements is the elimination of small, scattered, inefficient units by consolidation; this will often require new capital. It is to be hoped that such new capital will be familiar with mining ventures and aware of the need of competent engineering guidance. While mere size does not imply efficiency, a large company can effect many economies beyond the means of small companies.

Another means of improvement is the greater use of trade associations. Many large national associations have been formed which are of great and increasing benefit to the industries. The National Lime Association and the Gypsum Industries Association are examples of successful organization of this type. Many of the advantages held by large companies are available to small producers through co-operative effort. This may take the form of publicity and education of formulating standard specifications, of doing fundamental research, of co-operative engineering and chemical control of processes, of exchange of technical information on mining and milling methods, of studies of trade conditions, etc. Merely the getting acquainted with fellow producers is often of great value in improving trade conditions.

Some industries are less suited to large scale operations and, while the need of technical investigation and research is as great as in other industries, the individual producers are less able to help themselves. Furthermore, the literature of the non-metallic is frequently meager and unsatisfactory; sources of information are obscure and difficult of access, and consulting engineers familiar with the non-metallics are exceedingly few. These facts have been recognized by some of the governmental agencies such as the Bureau of Mines and strong efforts are constantly made to be of assistance to the non-metallic mineral industries.

An Information Exchange

One of the fundamental needs of the whole non-metallic mineral field is the making available of accurate and up-to-date technical information on mining, milling, marketing, and utilization, and the carrying on of fundamental research into the properties, preparation, and utilization of the non-metallics. Work of this nature is being done by individual companies, among both producers and consumers, but unfortunately the results of this work are not generally available to the public. Considerable valuable work is being done by governmental agencies such as the Bureau of Mines, Bureau of Standards, and Bureau of Public Roads. Sometimes an increase in the scope of such work is made possible by co-operative agreements between producers or trade associations and the bureaus.

Some of the larger trade associations are now conducting systematic research, the work being done either by their own staffs, by governmental bureaus or by such institutions as the Mellon Institute. The American Society for Testing Materials is working on standard specifications and tests for many non-metallic mineral products. But despite all this work there is great need for much more. The non-metallic minerals are so variable in their physical and chemical properties and they are used for such a great variety of purposes that a vast amount of investigation and research is necessary to increase efficiencies in production and utilization.

The value of the use of modern mining engineering methods is beginning to be appreciated by producers of the non-metallic minerals. Companies which have retained the services of competent mining engineers, experienced both in metal and non-metallic mineral mining, have been amply repaid. This influence is beginning to be felt and it is probable that modern engineering methods will be increasingly used in this field.

A Special Convention

THE NATIONAL ASSOCIATION OF SAND AND GRAVEL PRODUCERS will hold a special convention at the La Salle hotel in Chicago, Ill., November 15, at 10 o'clock, to take action on proposed changes in its constitution. These changes will make for wider usefulness and co-ordination of the association's efforts, and a representative attendance of the industry is especially to be desired.

Fluorspar Investigations by Bureau of Mines

THE importance of fluorspar in the steel and ceramic industries is so great, and accurate information on methods of mining, milling, and utilization, and on costs of production and possibilities of future production is so lacking, that it has been considered advisable by the Bureau of Mines to investigate all phases of the fluorspar industry in the United States.

At the request of, and in company with several Eastern fluorspar producers, examination has been made of the principal fluorspar deposits of the Western states. This examination was followed by an intensive study of the producing mines in Illinois and Kentucky. It was found that most of the deposits in the far Western states were small and could not be relied on to produce much surplus over the needs of the Western states. Costs of production in the Illinois-Kentucky field have increased greatly, owing to the increasing depth of the principal mines, the large amount of water that must be pumped, and the increased costs of labor and supplies. A report on all phases of the fluorspar industry is in preparation.

"Stone Trust" to Be Tried

IT has been announced that the case of the Indiana attorney-general charging the existence of a stone trust in Indiana will come up for trial on November 13.

In his complaint, the attorney-general alleges that the stone companies named are operating to effect the fixing of high prices in violation of fair trade competition. The suit is directed against the Indiana Limestone Quarrymen's and Contractors' Association, the Bedford Stone Club Auxiliary and certain individuals and companies.

Pays Out Millions Yearly for Rock Products

TEN millions of dollars are paid out annually to the producers of rock, gravel, and sand, which goes into the construction of buildings in Los Angeles county, California. Approximately 15,000,000 yd. of these raw materials are needed each year to meet the demands of local contractors, says the Los Angeles *Express*.

These figures are taken from cost distribution sheets of the Builders' Exchange of Los Angeles, prepared by Secretary Roy H. Brown. According to Mr. Brown, the demand is as yet only in its infancy. Building now under way and contracts already planned have reached the peak in the building history of this section and indicate requirements in raw materials which will tax producers to the last ounce of their productive energy in machinery and men.

Figured in weight, it takes approximately 60,000 tons of these natural products to meet daily needs. Downtown construction is now almost totally confined to class A structures, in which concrete and steel are the basic elements in material.

Sand leads all the other elements in demand. City specifications, which read that concrete shall be mixed in the proportion of 3½ parts of crushed rock to 2½ parts of clean, sharp sand and one sack of cement, might convey the impression that rock was in leading demand.

On the contrary, there is about three times more sand used than rock in local building operations, due to the fact that the plaster which goes into construction of every character has lime and sand for its chief ingredients.

In compiling these figures Mr. Brown has given no thought to the needs of road and highway construction, where material necessary for use is ordinarily available close to the scene of operation.

Actual building construction only has been considered, and in handling the 45,000 yd. of material required every day, taking it from the raw state through the process of finished material and placement into the buildings into which it goes, more than 25,000 men are daily employed by Los Angeles contractors.

Incidentally, it may be mentioned that workers in cement and plaster are sitting on the "top of the world" as far as earning capacity is concerned. Statistics gathered by the Builders' Exchange show that men engaged in these trades enjoy a scale of wages from $3 to $5 per day higher than skilled artisans in any other line. Contractors find no criticism of this situation, for the reason that, in addition to being a highly skilled workman, the cement and plaster worker is called upon for physical effort of a kind not required in any other line of building activity, and only men of the highest physical qualifications can meet the demands made upon them.

Cement Output for September

SEPTEMBER was the fifth consecutive record-production month in the portland cement industry according to figures of the United States Geological Survey just released. Daily production was at the rate of 381,000 bbl. as compared with 376,000 in August, the best full month on record. Since April production has been at a monthly rate well over 1,000,000 bbl. in excess of the best previous month on record. Shipments during September, although totaling less than August, because of transportation difficulties and car shortage, were at the rate of over 1,600,000 bags per day. (There are four bags in a barrel of 376 lb.)

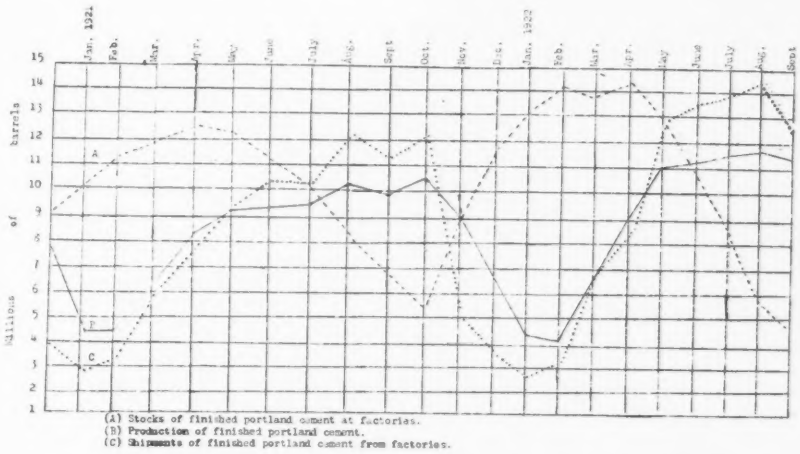
Stocks of clinker, or unground cement, at the mills at the end of September amounted to about 2,338,000 bbl. compared with 2,766,000 bbl. (revised) at the beginning of the month.

Increasing Use of Concrete Brick in Building Construction

AS reflecting the increased use of concrete brick in the construction of apartment houses, factories, office buildings and the like, the Portland *Oregonian* in a recent issue published an interesting story on the use of this type of building material, accompanied by a dozen or more illustrations showing buildings erected in the far West.

Two of Portland's many prominent buildings are built of the Shope patented process brick, as there are, says the *Oregonian*, structures of concrete brick to be found in all parts of the city. This brick is also being extensively employed in constructing fireplaces and ornamental work. The stability of the brick has been proved by exposure to fire, water, and the extremes of sleet, snow, and ice during the winter months.

The Shope Co. is operating a 100,000 plant in Portland. In August it turned out 361,000 brick.


Millions of barrels
Jan. 1921
Jan. 1922
(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories.

Monthly fluctuations in production, shipments, and stocks of finished cement

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT IN SEPTEMBER, 1922, AND PRECEDING MONTHS

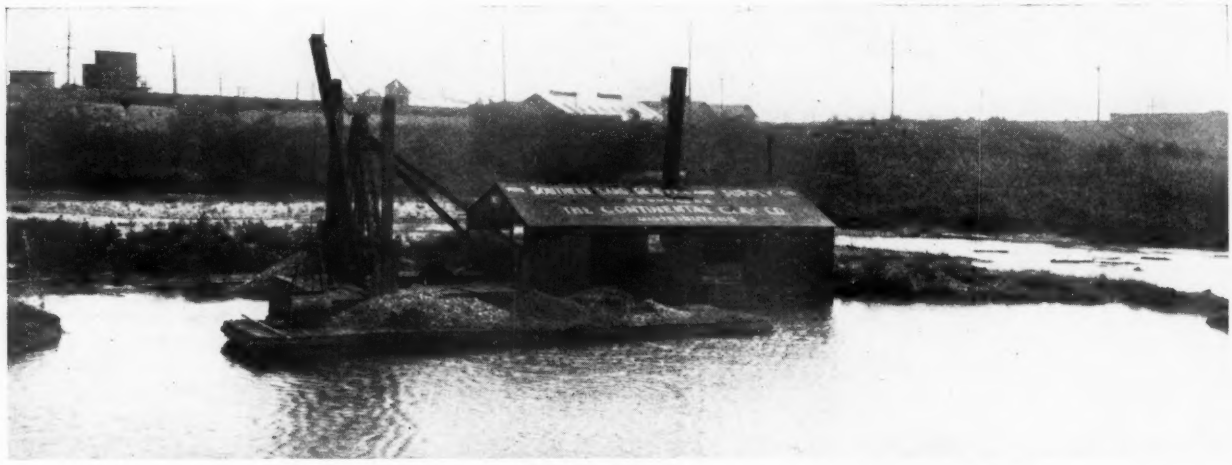
Month	Production (barrels)		Shipments (barrels)		Stocks at end of month (barrels)	
	1921	1922	1921	1922	1921	1922
January	4,098,000	*4,291,000	2,539,000	*2,931,000	10,300,000	*13,316,000
February	4,379,000	4,278,000	3,331,000	3,285,000	11,400,000	*14,142,000
March	6,763,000	6,685,000	6,221,000	7,002,000	12,000,000	*13,848,000
First quarter	15,240,000	15,254,000	12,091,000	13,218,000		
April	8,651,000	9,243,000	7,919,000	8,592,000	12,600,000	*14,470,000
May	9,281,000	11,176,000	9,488,000	12,749,000	12,450,000	*12,893,000
June	9,296,000	11,245,000	10,577,000	13,470,000	11,150,000	*10,718,000
Second quarter	27,228,000	31,664,000	27,984,000	34,811,000		
July	9,568,000	11,557,000	10,301,000	13,850,000	10,414,000	*8,433,000
August	10,244,000	11,664,000	12,340,000	14,361,000	8,280,000	*5,746,000
September	10,027,000	11,424,000	11,329,000	12,444,000	6,953,000	4,726,000
Third quarter	29,839,000		33,970,000			
October	10,506,000		12,114,000		5,348,000	
November	8,921,000		5,195,000		9,091,000	
December	6,559,000		3,697,000		11,938,000	
Fourth quarter	25,986,000		21,006,000			
	98,293,000		95,051,000			

*Revised.

Doubling the Bin Capacity of a Sand and Gravel Plant

The Southern Sand, Gravel and Supply Co., in the heart of the city of Columbus, has found means to increase its bin capacity from 1000 to 2000 tons. The company has a truck and wagon trade and therefore must handle its loading quickly and cheaply. This article will tell you how this was accomplished

SOME plants are so situated as to make ground storage impossible, although it is conceded to be the cheapest form of storage so far as initial cost is concerned. On the other hand, bin storage is the most expensive as to initial cost, but the cheapest form of storage to operate. However, both forms of storage have their respective merits and some plants utilize both.



The dredge in action equipped with stiffleg derrick and 2½-yd. clamshell bucket

The Southern Sand, Gravel and Supply Co. has a plant located in the heart of the city of Columbus, Ohio, along the banks of the Sciota river. Its business is naturally concentrated in the city and is a truck and wagon trade. The loading must be done quickly and economically to keep up with the constant stream of trucks passing to and from the plant.

As originally built, the plant had a 1000-ton bin capacity. As business increased this storage was found to be inadequate and a ground storage was created with adequate material-handling machinery. Soon the business outgrew this storage and the company had to build another storage bin, with a capacity equal to that of the first one and alongside of it, making the total bin capacity 2000 tons. The double unit is very flexible as material of any size can be put in it.

The sand and gravel is excavated from the Sciota river by a dredge equipped with a 2½-cu. yd. clamshell bucket and stiff-leg derrick. Material is taken from the river at depths ranging from 14 to 38 ft. and deposited on barges. When a barge has been loaded it is towed to the plant by an electrically operated hoist; the motor is 20 hp.

The material on the barge is reclaimed by a 2½-cu. yd. clamshell bucket operating on a stiff-leg derrick and dumped into the hopper of the screening plant, which is 54 ft. above ground level. The derricks and clamshell buckets are of the company's own design and manufacture, while the hoist is a Thomas two-drum type of 90-hp. capacity. A 20-hp. hoist swings the derrick boom. The derrick foundations are of reinforced concrete. The relative locations of the barge, derrick and plant are shown in one of the accompanying illustrations.

The material deposited in the screening plant hopper is fed to a battery of Link-Belt conical screens through a reciprocating feeder, operated by an eccentric from the line shaft. These screens are 2 in., 1¼ in., ½ in., and 5/16 in. in size. The gravel retained on the 2-in. screen is chuted to a No. 5 Austin gyratory crusher which reduces it to 1¼ in. and down, and discharges direct into a rotary screen with 1¼-in. perforations. Material that is 1¼ in. and under is reclaimed by a bucket elevator of 55-ft. centers and 16x8x11-in. buckets mounted on a chain belt and deposited back into the original 2-in. scalping screen. All material over 1¼ in. is chuted to a No. 3 Gates gyratory crusher. The discharge from this crusher goes to the elevator which reclaims material from the rotary screen.

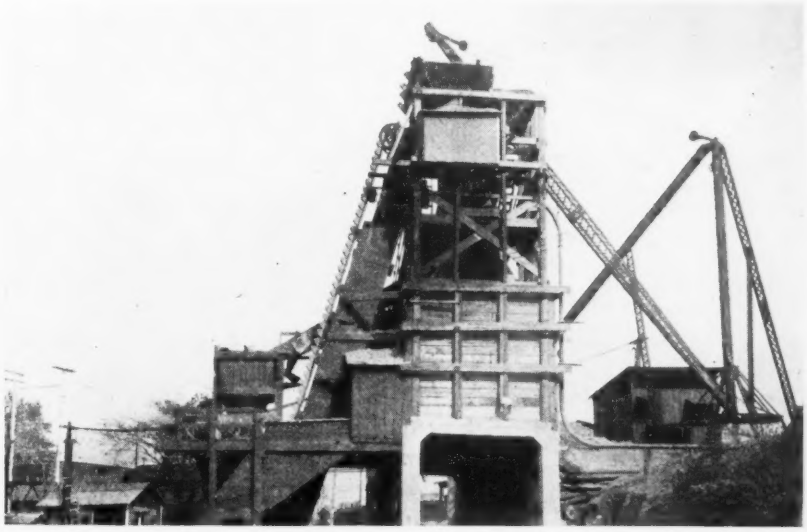
As the gravel is screened, the four products, 2 in., 1¼ in., ½ in., and 5/16 in., are chuted to their respective bins. Material under 5/16 in. is reclaimed by a small elevator of 15-ft. centers, with perforated buckets, which discharges to the sand bins, the perforations allowing the water to drain as the material is being elevated.

The plant capacity is 550 yd. per 10-hour

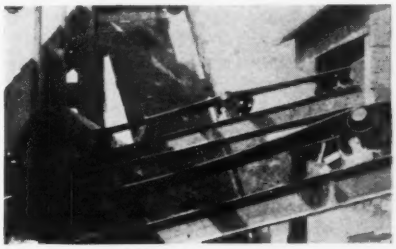
day. The bin storage adjacent to the original bin is divided. as the original bin, in four sections, holding 2-in. material, 1¼-in., ½-in., and sand. When the old bins are filled a butterfly valve is opened on the chute which passes the material into hopper-feeding belt conveyors 18 in. wide with 20-ft. centers, depositing it in the new bins. Each sized material has its respective conveyor. One of the illustrations shows two of the belt conveyors delivering to the new bin storage.

In sand and gravel operations in and around Columbus there is a shortage of sand, therefore the Southern Sand, Gravel and Supply Co. has installed an American ring pulverizer to *manufacture* sand for them. The ½-in. material, or pea gravel, is spouted direct to the pulverizer which is run by a 75-hp. motor and the pea gravel is converted to 1/16-in. sand.

Hopper and conical screens. To the right is the elevator from the crushers



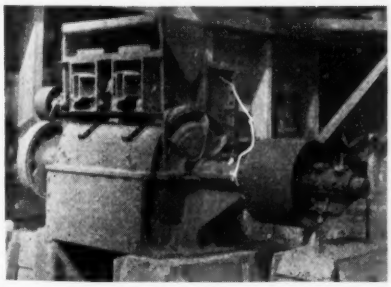
The plant proper and shore derrick. The latter elevates the material 54 ft. before dumping it into the hopper



Belt conveyors from the screen to the storage bins

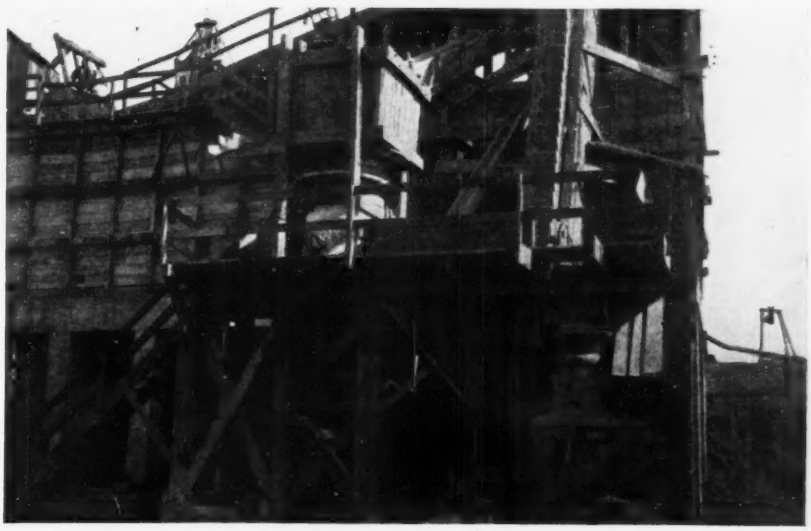
spondingly adjusted. In either case, the resultant product from the pulverizer is reclaimed by a bucket elevator and deposited in the bins. The sand or chips are made only as they are needed.

For washing purposes in the screening plant an 8-in. American pump with a capacity of 1200 g.p.m. is used. The plant is entirely electrically operated and uses approximately 400 hp. A ground storage



American ring pulverizer, driven by 15-hp. motor

The pulverizer has 3/16-in. grates and a capacity of 20 tons per hour. If it is desired to manufacture chips for road surfacing, the material is spouted from the 1¼-in. or 2-in. bin to an 18-in. belt conveyor of 14-ft. centers, which discharges direct to the pulverizer. Of course, in this operation the grates must be corre-



The crushing units and the reclaiming bucket elevator

is also provided adjacent to the bin storage and a Byers crane used for handling and rehandling.

This company has a 15-year franchise from the city to dredge for two miles of the Sciota river, thus insuring an adequate supply of material for several years to come. David Broadfoot is general manager of the company.

New Form of Report for Mechanical Analysis of Sand and Gravel

Developed by R. C. Yeoman, secretary and engineer of the Indiana Sand and Gravel Producers' Association, this new report will prevent other interests from "passing the buck"

LATE refinements in the manufacture of concrete necessitates careful examinations of aggregates. It was not many years ago that cement was made responsible for every failure of concrete, until the manufacturers of cement co-operated with one another to standardize their product. The buck has been passed to the next most tangible constituent, sand and gravel, until it has become popular to indict the grading or quality of aggregates if the concrete fails. Sand and gravel producers found themselves, as did the cement manufacturers, at the mercy of the other interests in the matter of specifications for the use of their product.

On every important work it is now required to test the aggregates as to cleanliness, quality and grading, as well as to test cement. The Indiana Association of Sand and Gravel Producers employed commercial and university laboratories for a number of years to do this work. This service was reliable and well done, but under certain circumstances inexpedient. It became necessary and desirable to establish their own laboratory, which they did in 1920.

In Indiana there are numerous varieties of specifications for sand and gravel to be used in road and building construction. Every engineer is by law his own authority and may make specifications to suit his own ideas. Influenced by a variety of local conditions and wide differences between national investigators, there has been developed a conglomeration of specifications, particularly as to sizing, which makes the problem of production very complex. Along with each specification for grading, is included a peculiar set of laboratory screens or sieves for testing.

There are two kinds of laboratory apparatus for this purpose, screens having round openings and sieves having square openings. These have been arranged in various series, some having a definite purpose or relation and others apparently none. For instance, the Tyler standard series start with 1½ in square opening and reduce the width of the opening by ½ in. until the 200 mesh with 40,000 openings to the square inch is reached. Ten sizes are required to cover this range. Screens are made on diameters of even inches, one-half, one-quarter and one-eighth. The various combinations of round openings and square openings are so numerous that to meet all the requirements, a well equipped laboratory must have 30 or 40 sizes of screens and sieves. Many times the question has arisen as to relation of tests on one set of screens or sieves to that on another. To answer this the diagram listing all sizes and forms was developed.

Professor Abrams of the Portland Cement Association first designed the graphical chart giving equal spacing of the sieves in the Tyler standard by plotting the logarithm of the area of opening. The diagram on page 31 places in the same manner the sieves and screens in proper relation to the Tyler standard sieves. With this diagram, therefore, it is possible to make a mechanical analysis from any series of screens or sieves covering the range required and transpose aprpoximately the percentages to another set. This is the particular advantage claimed for this device. The value of a graph in arranging information of this character is well known. Besides the ordinary uses made of graphs, the one special feature mentioned above is illustrated as follows:

A certain county engineer had a specification dividing sand and gravel on the one-eighth and one-fourth circular opening. The sample was brought in to the laboratory to be tested through those screens. The laboratory did not have a ⅛ circular opening screen, but did have the Tyler standard set. The test was made and results plotted on the diagram. By drawing a straight line from the "per cent" on No. 4 and on No. 8 sieves, the intersection of this line with the ⅛-in. ordinate gives the approximate percentage or division on that screen. The test on the ¼-in. screen was actually made and found to check with the interpellation on the diagram.

This diagram has been tested by plotting the results of the analysis made of the same material on the different screens and sieves and found to be approximately correct. This report sheet is shown on the opposite page. The sieve dimensions are:

LIST OF SIZES AND DIMENSIONS OF OPENINGS

Commercial size of sieve	Width of square opening Inches	Diameter of round opening Inches
3	3.000	3.000
2 1/2	2.500	2.500
2	2.000	2.000
1 1/2	1.500	1.500
1 1/4	1.250	1.250
1	1.000	1.000
3/4	0.750	0.750
1/2	0.500	0.500
3/8	0.375	0.375
5/16	0.3125	0.3125
1/4	0.2500	0.2500
3/16	0.1875	0.1875
No. 4	0.1850	.....
No. 6	0.1310	.....
1/8	0.1250	0.1250
No. 8	0.0930	.....
No. 10	0.0650	.....
No. 14	0.0460	.....
No. 20	0.0328	.....
No. 28	0.0232	.....
No. 30	0.0198	.....
No. 40	0.0150	.....
No. 48	0.0116	.....
No. 50	0.0110	.....
No. 60	0.0087	.....
No. 80	0.0068	.....
No. 100	0.0055	.....
No. 200	0.0029	.....

Service Order No. 25 Is Amended

THE Interstate Commerce Commission on October 18 amended its Service Order No. 25 by prescribing a rule to govern the supply and distribution of open-top cars to mines which customarily do not or cannot load a car within 24 hours after placement, commonly called wagon mines, and by adding foundry sand and materials for the construction and repair of locomotives and cars to the list of commodities that may be loaded into open-top cars in the direction of but not beyond the mine or mines to which such cars are destined for coal loading. The amendment, No. 1, was made effective, as to the so-called wagon mines, on and after October 23, and forthwith, as to the added commodities.

INDIANA SAND AND GRAVEL PRODUCERS ASSOCIATION

ENGINEERING DEPARTMENT

REPORT OF SAND AND GRAVEL TESTS

Test No..... 19.....

For .....

Address .....

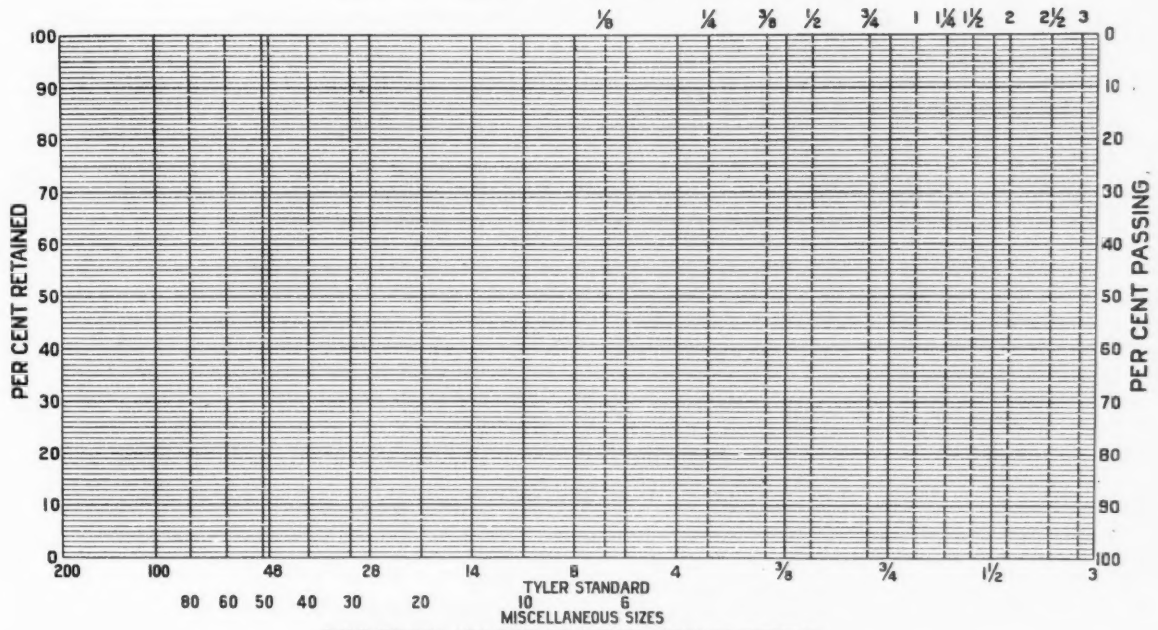
Name of Material..... Identification.....

Submitted by..... Sampled by..... on.....19.....

Sampled from..... Quantity represented.....

Source of Material..... To be used.....

COMMERCIAL NUMBER OF SCREENS, ROUND OPENING



COMMERCIAL NUMBER OF SIEVES, SQUARE OPENING

Sieve Number	Shape of Opening	Total Per Cent. Retained on Each Sieve	

Special Tests	
Silt	
Organic Impurities	

Remarks:

Respectfully submitted,

_____

_____ 19____

(SEE SIEVE DIMENSIONS ON OTHER SIDE)

Screens for Washing Plants

By Edmund Shaw
Consulting Engineer, Chicago, Ill.

Part II. In this installment Mr. Shaw deals with the common fault of stationary screens; why the step series is preferable; how to avoid splashes and leaks; some of the freak screens; and also includes the principles of stationary screens

Opening Should Be a Slot—Not a Round or Square Hole

BUT whatever the type of material that is chosen, the opening should be a slot and not a round or square hole. In woven wire such screens are in common use and are commonly known by such trade names as Ton-Cap. There is a welded wire screen of the sort which is made with very long meshes, in proportion to the width. Punched metal is made with straight and diagonal slots, but only the straight slots are suitable for stationary screens. As usually made, the slots are two or three times as long as they are wide, but it is often better to make them much longer in proportion to the width. Edison used very long slots on his fine screens. Fig. 1 illustrates two kinds of punched plates which are used in stationary screens.

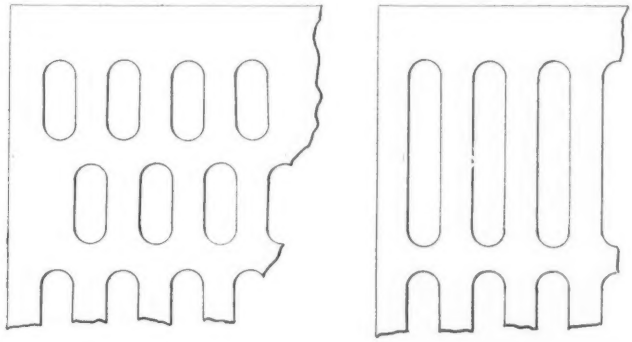


Fig. 1—Slotted punched metal used in stationary screens. Staggered slots prevent water and fines finding a straight path, and long straight slots used in dry screens

The reason why the opening should be a slot and not a round or square hole is shown in the diagram, Fig. 2, which represents the path of a grain coming down the surface of a screen and passing through a hole. If the hole is just slightly larger than the grain, the grain will not pass, for the speed of the grain will cause it to jump the hole or to strike on the edge. After striking the edge it will rebound, and in watching the grains run down a stationary screen you can see these bounding grains clearing the length of the screen in a few jumps without having had a chance to go through one of the holes.

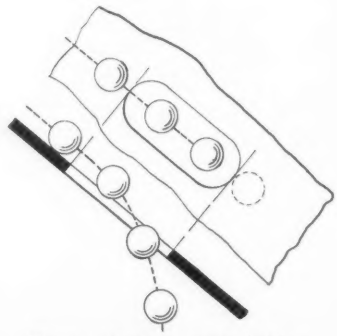


Fig. 3—Path of grain falling through a slot

Special Slots to Prevent Blinding

If the slot is made very long, we have the bar screen or grizzly, which will give a much greater screening capacity than a screen made of meshes. But sometimes a limit has to be placed on the length of the slot, on account of the nature of the material to be screened and the specifications to be met. If this material contains many long thin pieces, and the specifications say that the length of any piece shall not exceed so many times its diameter, then the slot must be shortened to keep out these long, thin pieces. Round, flat pieces also give trouble by slipping through the bars of a grizzly and going into the undersize.

A long time ago some one found out that by spreading the bars of a grizzly slightly at the lower end he could reduce the tendency of the thin and wedge-shaped pieces to wedge themselves between the bars. This is because the opening between the bars was growing wider all the time as the piece descended. The same principle has been applied to punched plate screens, which have been made with slots like those shown in Fig. 3. The idea seems to be a good one, but screens with slots of this kind have not come into very general use.

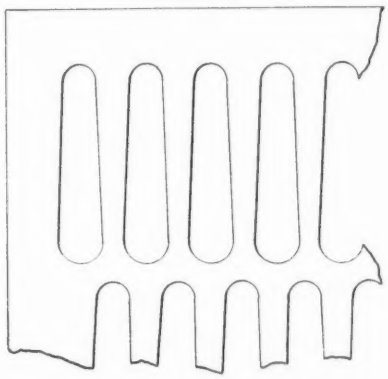


Fig. 2—Slots widened in the direction of flow to prevent blinding

Other things being equal, we may say that the efficiency of a screen is in proportion to its area, but few of us recognize how much greater area is required for fine screens than for coarse screens. As an illustration, let us consider the difference between 1-in. diameter pebbles and ¼-in. diameter pebbles. A cubic foot of the first named size would contain 1728 grains, and a cubic foot of the second would contain 110,592 grains. So if we wanted to spread these out into a bed one grain deep we would have to allow 67 times as much area for the second as for the first.

Fortunately, we do not have to make a

law of this and follow it in practice, for if we did very fine screening would demand such areas of screen cloth that mills could not be built big enough to hold them. We deal with mixtures of sizes in practical work and not with a mass of grains of a single size, and the number of grains of the same size as that of the mesh opening is fortunately small. But it is true that for fine screening the area must be greatly increased to maintain the same screening efficiency.

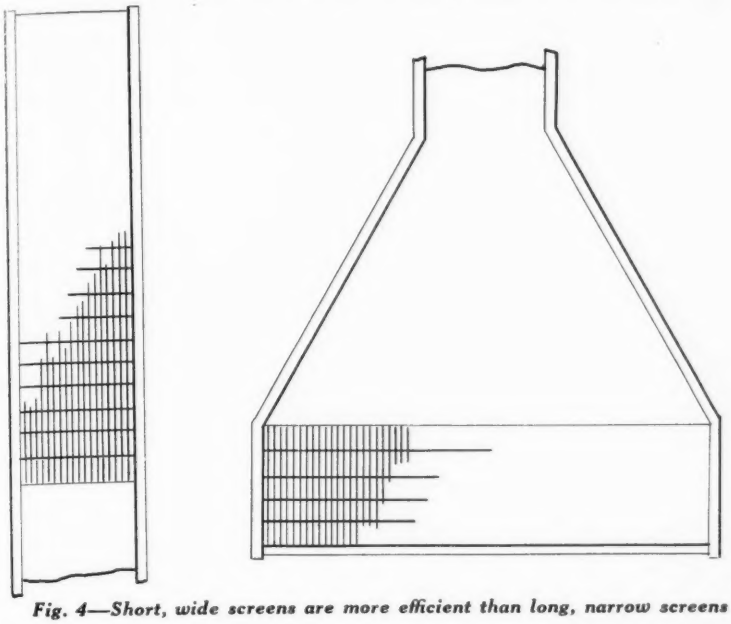


Fig. 4—Short, wide screens are more efficient than long, narrow screens

The Common Fault of Stationary Screens

And not only is the area important, but in stationary screens the area must be given by increasing the width rather than the length to get efficient results. The commonest fault of stationary screens, as was said at the beginning of this article, is that they are too long in proportion to their width.

The writer has noted in several plants screens 5 or 6 ft. wide and 10 ft. long taking the discharge from a 10-in. pump. Practically all the screening that was done on such screens was done in the first 2 or 3 ft., and the remainder of the screen might as well been blanked off. Usually with such screens there will be found a man with a hoe whose duty it is to pound on the screen cloth and jar out the blinding particles, and also to drag the accumulation of oversize across the screen and over the edge with the hoe.

One large company which operates some 25 plants or so uses nothing but stationary screens, and to take the discharge of a 10-in. pump it uses a screen 18 ft. wide and 5 ft. long. Another plant handling about the same amount uses a screen 20 ft. wide, and tests on the screens show that this width could be increased with improvement to the work. In both cases the work of the screen was to separate sand from gravel, although they were not of quite the same mesh.

One reason why a long screen loses in efficiency is that the grain travels faster all the time as it goes down the screen. It is subject to the same "acceleration of gravity" as a stone which is thrown into the air, which continually increases its velocity as it falls. So a grain that is traveling at the right speed for screening may be going so fast that it will jump the screen openings a foot or two farther on.

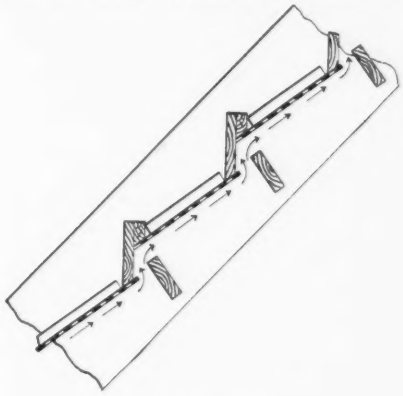
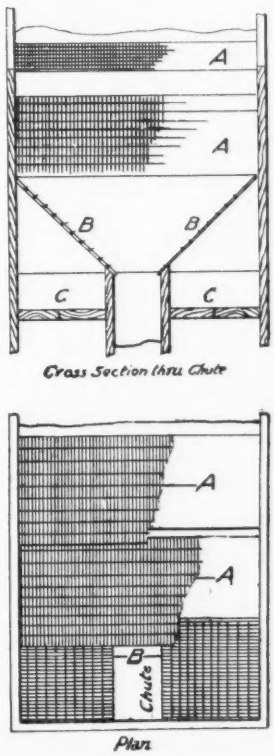


Fig. 5—This section shows a long screen broken into short, wide screens, with steps and baffles. It is more effective than a single long screen

In practice, this condition may be met by breaking up the long screen into a series of wide short screens arranged in steps. At the end of each step a baffle is placed against which the material to be screened strikes and is brought to a standstill. Then it falls to the next step and the process is repeated as many times as there are steps. In this way the grains are kept from ever reaching a velocity that would cause them to jump over the screen openings. Fig. 5 shows a section through a stationary screen of this kind arranged in three steps. The screens shown have all the same size openings. Screens of this type have been built with iron frames and baffles.



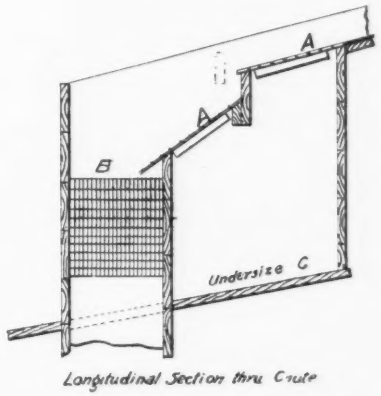


Fig. 6—How the oversize is carried in a chute through the undersize

Why the Step Series Is Preferable

In the article on the Tomkins Cove plant, already referred to, a diagram is given of the arrangement of the station-

ary screens. Instead of being broken into steps they are placed in a vertical zigzag line, so that the falling grain has to stop and turn around and go the other way, thus preventing it from attaining too great a velocity in the same way that the steps and baffles in the diagram do. This arrangement makes a narrow and compact screening unit which may be enclosed in a dust-tight box, so it is particularly adapted to stone-crushing plants. But for washing plants the writer prefers the step series given in the diagram. Everything is in sight and the screens are easily cleaned and changed. It is also simple and inexpensive to build.

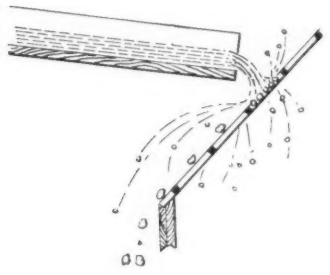


Fig. 7—The wrong way to feed a stationary screen. This section through the feed apron and screen shows how the oversize is contaminated by water splashing and carrying fines and clay with it

The arrangement shown may be used for either wet or dry screening, but if used for wet screening there must be steps enough to insure that all the water coming with the feed passes through the screen, as otherwise clay and fine sand will be sure to accompany it. A better arrangement for wet screening (because it takes less headroom) is that of a "broken pitch" screen. The first of the steps is made much flatter, so that the water and most of the undersize go through this screen. The succeeding steps are of the right pitch for dry screening. Such an arrangement has been found to do very satisfactory work in practice. A section of such a "broken pitch" screen is given in Fig. 6, in the two upper screens, A, A.

In all these diagrams the feed is supposed to come on the screen in the direction which the screen pitches, so that it flows down the screens as a river flows down a cascade. There is another method of directing the feed to the screen, shown in Fig. 7. The idea is evidently to give some impact to the grains and drive them through the meshes. In the writer's opinion it is a great mistake to feed a screen in this way. The impact forces the difficult grains into the meshes, so that the portion of the screen where the feed strikes becomes solidly blinded after a few moments' run. Then the water striking this blinded portion splashes and carries a lot of fine grains with it into the oversize.

How to Avoid Splashes and Leaks

Splashes and leaks are to be especially avoided in working stationary screens, which means that they must be well constructed and all the joints at the side well calked. It is astonishing how much fine sand and clay a small and harmless-looking leak will carry into the oversize, and oftentimes the screen is blamed for doing poor work when the real trouble is that of leaks and splashes. Akin to this trouble is that caused by water running down the bars of a bar screen or along the blank spaces at the sides of a punched plate or wire screen, so that it carries fines into the oversize. If the slots in punched plates are not staggered, straight paths of metal are left between the holes down which the water runs very freely, carrying sand and clay. The holes, or slots, in punched plate screens, should always be staggered, like those shown in the illustration for wet screening.

A certain amount of clay and fine sand will always stick to the larger pieces in wet screening, because these will stick to a damp surface anywhere. Where the feed to the screen comes from a pump, as it does in so many cases, there is so much water present, and the grains are so well scoured by passing through the pump and the pipe line that this is not a serious matter. With other types of plants that feed the material with much less water it may be serious, and it is advisable in such cases to use sprays to clean the oversize after the water that accompanies the oversize has passed through the screen. A spray applied in this manner has other uses than that of washing off the grains. It acts as a baffle to check the flow of the material down the screen, and it also supplies fresh water to help the undersize particles through the meshes. A longer screen may be economically used with sprays of this kind.

Where more than two products are to be made with stationary screens, they are placed in series, and battles have been fought between those who advocate placing the fine screens first and those who advocate placing the coarse screens first. Without presuming to decide the question, it may be worth while to present some of the arguments here.

Placing the fine screens first makes a much simpler plant. The whole screening system may be merely a series of such steps as are shown in Fig. 5, and if it is desired to give more area to one certain size and less to the following size it may be easily done by changing the screen on a step. The undersize of each screen falls directly to a bin or stock pile, and there is no water to bother with after the first screen. The water and sand are taken off at the highest level of the plant, and this gives plenty of headroom to install settling tanks to catch the sand. The heavy pieces of oversize travel over all the screens and this helps to keep them clean by vibrating them, so that the difficult grains will not stick and blind.

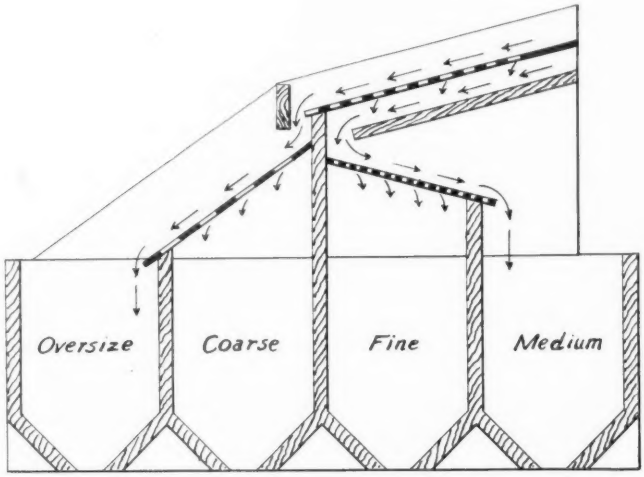


Fig. 8—These three screens are arranged in "compromise" system

These are all good arguments, but the opposing side points out that the screening is always better where there is plenty of water to wash the undersize through the screen. And there is no doubt but that the presence of much oversize on the screen covers a lot of the holes and hence reduces the number that the finer sizes can pass through. Washing sprays may be used, as the undersize is always accompanied by water, and this helps the work. To sum up, taking out the fines

first results in a much simpler plant and less headroom and a better chance to settle the sand, while taking out the fines last gives better conditions for screening.

If the fines are taken out first, the screening system, as has been said, is merely a series of steps, one screen following another, and the feed passing from one to another as water flows down a cascade. But if the coarse sizes are taken out first, the oversize must pass through the undersize or to the sides in order to get to the bin. Figure 6 shows how this is done. The oversize comes off the edge of the screen A and falls on the screens B, which are set at right angles to A. These screens B lead to a chute which passes down through the apron C on which the undersize flows to the next screen. This arrangement takes about as little headroom as any that can be devised as it utilizes the angle of the lower screens B to carry the oversize to the chute.

Compromise Method of Screens in Series

There is a compromise method of placing screens in series, where three or more screens are used, which has some of the advantages of the two systems already described and has the further advantage of saving headroom. In this system the first screen is of an intermediate size. The oversize goes to a dry screen and the undersize to a wet screen for further sizing. Thus the dry screen is used for the coarse sizes, where it is most efficient, and the wet screen is used for the fine sizes where the screening must be as efficient as possible. This same arrangement, splitting the feed on an intermediate size and sending it two ways, is also used with revolving screens in order to save headroom.

A diagram of three screens arranged for this compromise system is shown in Fig. 8.

Some of the Freak Screens

The stationary screen has been made in a number of freak or unusual forms, for the improvement of screens has always been a tempting subject to inventors. Some of these forms are worth mentioning. One of these has a line of inverted V's across the screen to turn the grains so that they would make a zigzag or diagonal path down the screen. This prevented acceleration and gave a longer travel. The V's were made low enough so that the larger pieces would roll over them and would not interfere with the screening.

Another inventor placed a sort of tongue, or guard, over each hole to keep oversize pieces from trying to enter. A third employs a curved screen, like a segment of a revolving screen, the idea being to check the speed of the particle as it fell. It might be called a stationary "revolving" screen, the fall of the grains taking the place of the travel of the grains which is set up when a revolving screen is turned. None of these forms has come into much use that the writer knows of, but it is possible that they might be developed into more efficient forms by further experimenting.

The Principles of Stationary Screens

To sum up the principles of stationary screens, it may be said that:

1. It is possible to find a pitch, or angle with the horizontal, at which the most screening will be done with the least tendency to blinding.
2. This pitch varies with the kind of fabric used and the size and nature of the material to be screened.
3. The apertures in the screens should be slots and not round or square holes, the length of the slot being in the direction of the travel of the grains. This allows for the trajectory of the grain.
4. The screen area should be much greater for the fine mesh screens than for the coarse mesh screens.
5. Short and wide screens are much more efficient than long and narrow screens. To do the best work the long, narrow screen should be broken up into steps of short, wide screens, with baffles to check the speed of the grains.
6. Stationary screens may be used in series to produce a series of sized products. In such a series, if the fines are taken out first, the plant will be simpler, but the screening will not be so good, as all the screens but the first will be dry screens. If the coarsest size is taken out first the plant will cost more to build and will require more headroom.

(To be continued)

"Who Is Fippin?"

SOME interesting booklets are being put out by the Fippin Agricultural Consulting Service of Washington, D. C. Designed primarily to interest owners and prospective owners of agricultural property and those interested in its improvement and development, the booklets also interest producers of liming and other fertilizing materials for use on soils.

Elmer O. Fippin

This service has recently been established by Elmer O. Fippin, who is its director and who is well-known to practically every lime producer in the country from his connection as general manager of the National Lime Association for two years. From this latter position Mr. Fippin resigned last spring in order to establish this agricultural consulting service.

The first booklet of the series described the scope of the service, tells why the service is developed, the types of service available and lists 24 classes of individuals and organizations who may need the service. Pamphlet 3 is entitled "Who is Fippin of the Agricultural Consulting Service?" and describes briefly the career and experience of Mr. Fippin from the time he graduated in agriculture from Ohio State University in 1900 to the present time.

Mr. Fippin's offices are located in the *Washington Star* Building.

Ohio's Greatest Fertilizer Year

OHIO farmers will purchase the greatest amount of fertilizer this year through co-operative organization ever in their history, according to reports at the Ohio Farm Bureau Federation.

More than 22,000 tons alone have been ordered through the Commercial Service Co., the buying organization of the Farm Bureau. With last spring's purchases this brings the total co-operative purchases well over the 40,000 ton mark.

Frederick Franz, for the past four years chief engineer of the Terminal Engineering Co., has established an engineering office at 27 Warren street, New York City, for the purpose of solving special problems of engineering relating to labor-saving machinery for industrial plants.

Production Costs of Rock Products

By Oliver Bowles

No. 2—Ways and Means of Reducing Costs. In this installment Mr. Bowles tells why there should be wider use made of mechanical equipment, of improved methods of overburden removal; efficient blasting; simplified transportation; byproducts development; cost keeping, and association work

IN ROCK PRODUCTS for October 21 it was pointed out that through their extensive use rock products have a wide influence on the comforts and activities of practically the entire public. Consequently, any circumstance which increases their availability promotes the general welfare of the community so affected.

An enlarged application of these useful commodities is brought about by a reduction in price levels, and hence it is of first importance to consider means of accomplishing such reductions. While freight rates, labor conditions, methods of distribution, and other elements enter into the problem, the present discussion is confined entirely to at least a partial attainment of the desired reductions through promoting economies in production. A low production cost is reflected in benefits to both producer and consumer, hence the importance of giving careful consideration to its attainment.

Mountains of waste add greatly to the cost of slate production

Wider Use of Mechanical Equipment

This is an age of machinery. Thousands of articles that now contribute to the comfort of the masses would be available only to the wealthy were it not for the extremely low cost of production made possible by the use of machinery. During recent years the rock products industries have seen many notable improvements in equipment such as mechanical loaders, power excavators, compressed air drills, channeling machines, etc. Specific ways in which power equipment could be used to better advantage will be discussed later. At this point it is desired to merely emphasize the fact that under modern wage conditions the use of slow and laborious hand methods of handling rock products should be avoided as far as possible. One machine runner can commonly accomplish as much as 10 or 12 laborers.

The wider use of mechanical equipment is in no way injurious to the worker; it tends rather to greatly improve his condition. When the power loom was first invented the English weavers destroyed the machines because they feared that loss of employment would soon result if the rapidly working mechanical equipment were left in operation. The fallacy of this contention was soon apparent, for mechanical weaving was so much cheaper than hand weaving that the price of fabrics was reduced, and the greatly increased demand for them made weaving a very important industry, employing thousands more workers than when the old hand methods were used. The same principle holds in the stone industries, for each device that lowers the production cost extends the market for the product.

Furthermore, the machine runner has less toilsome work, with better pay, than the laborer. His work, however, requires more intelligence, skill and training, and thus machine operation is a decided benefit in that it encourages advancement, and offers an incentive to the worker to educate himself and his children for something better than mere day labor.

Improved Methods of Overburden Removal

The removal of overburden is a subject that is of interest to practically all rock products operators, for most deposits of rock, as well as many sand and gravel beds, are covered with varying thicknesses of waste material that must be removed in the process of quarrying or excavation. In many regions the removal of a heavy blanket of overburden constitutes one of the chief items of production cost.

The problem is complex because conditions are extremely variable, and many different methods may be used. During several years' study of quarries the writer has observed at least 13 general methods

At a New Jersey quarry this equipment handles 170 tons of rock per day

of removing overburden, and numerous variations of each. There is no phase of quarrying where more room for improvement is apparent, or where there is better opportunity for cutting down costs, than in the stripping operation.

In many regions where methods are in other respects highly efficient, stripping is conducted with the greatest crudity. Hand loading with pick and shovel is still widely employed. The soil may even be shoveled from bench to bench at successively higher levels, thus involving repeated handling by a slow and costly method. When a building contractor finds it economical to use a steam shovel for such a small excavation as the basement of a new house it is evident that there is no economy in using the pick and shovel for a continuous operation involving the removal of thousands of cubic yards of soil.

Conditions vary so greatly in different quarries that it is not possible to recommend any system of stripping for general use. There may be exceptional cases where even the pick and shovel are the best tools to employ, but every operator should endeavor to use mechanical means wherever possible.

The following types of equipment that have found successful use offer wide choice: hydraulic, washing and screening, ordinary road scraper, wheel scraper, dragline scraper, dragline excavator, tractor excavator, steam shovel, clamshell bucket on traveling crane or derrick arm. The choice will depend on capital available, quarry conditions, nature of material to be handled, and extent of proposed operations.

The steam shovel is the most widely used. Small operators may use some less costly equipment such as dragline scraper or tractor excavator. All conditions should be taken into account, and the relative merits of the different systems considered. Conservatism of operators in blindly following crude and antiquated methods from one generation to another is accountable for many of the examples of excessive stripping costs.

Blasting Has Been Highly Developed

Blasting methods are governed largely by the nature of the desired product. For such materials as crushed stone or rock for cement manufacture excessive shattering is little or no detriment, and heavy charges are used. Where lime or furnace flux are produced stones varying from 4-in. to "one-man" size are required, and blasting should therefore be so conducted as to give a minimum of fines. For dimension stone, either limestone, sandstone, slate, granite or marble, blasting should be used very sparingly, and the charges should be very light.

This belt conveyor carries 18,000 tons of rock per day

A rugged surface stripped by the hydraulic method

Rough stone blasting has been developed to a point of high efficiency during recent years. The advent of steam and compressed air drills marked one great advance, and this was followed by the wide use of blasting in deep churn drill holes. In best practice five to nine tons of rock are shattered for each pound of explosive used. The best arrangement of drill holes, and the character and amount of explosive to be used, must be determined largely by experiment, for they are dependent on the nature of the rock ledge, and rock ledges vary greatly in character. The foreman in charge of operations should record each blast in terms of cost, and in tons of rock moved per pound of explosive, for such figures are valuable

guides in determining the relative efficiency of blasts when the burden or spacing of drill holes is varied, or when different quantities or grades of explosive are used. The intelligent quarryman may thus gradually modify his method until a low blasting cost is attained.

For the production of lime, furnace flux and certain other products low-grade explosives are found to give best service, for they tend to push out the rock mass without excessive shattering. In dimension stone blasting the important item is not cost but costliness, for a misjudged or ill-directed blast may cause damage

This dragline excavator is stripping a rough limestone surface

far in excess of the actual blasting cost. Unless skilfully conducted, blasting does more harm than good, and should be employed to a limited extent only.

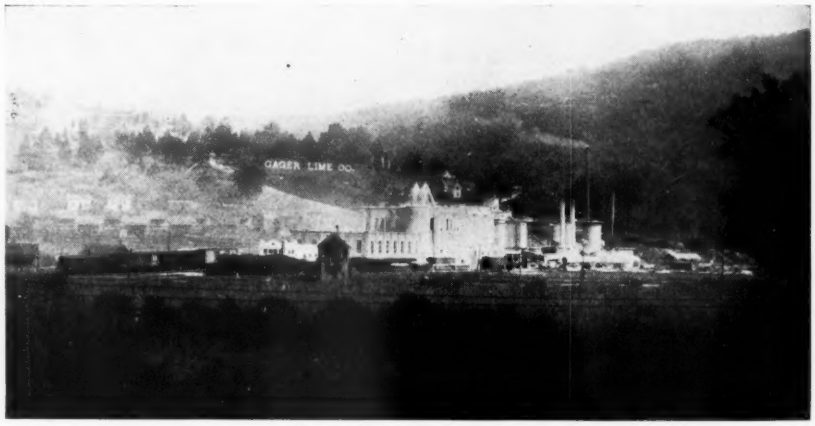
Mechanical Loading

In a preceding paragraph attention was directed to the excessive cost of removing overburden by hand methods. The same principle applies to rock loading at the quarry face. In small quarries, especially where it is necessary to sort the materials according to size or quality, hand loading may be the most practical method, but in large quarries mechanical methods are to be preferred. The necessary sizing or clay separation may be accomplished by screening and washing, and the separation of inferior fragments may be done on a picking belt. Many mechanical truck or car loading devices are now on the market, and great economy in handling materials may be brought about by their wider use.

Simplified Transportation Systems

Rock or soil are heavy materials, and transportation in or about the quarry constitutes an important cost item. High transportation cost is commonly due to excessive rehandling of materials. Methods of transportation should be made as simple as possible. The transfer of materials from one type of haulage equipment to another is usually slow and costly. Quarry waste is sometimes hauled up an incline in cars and dumped into a hopper from which it falls into dump cars and is taken to the waste pile. The necessity for such rehandling is due to faulty design in the track layout, where no provision is made for switching cars of waste to a track leading to the dump.

Transportation costs may be greatly reduced by utilizing the force of gravity. In pit quarries it is usually possible to maintain a gentle grade from the quarry face to the foot of the incline, and this



An efficient lime plant in the South using gravity transportation

is desirable, for thus gravity assists in moving the loaded cars.

Elimination of Waste

In many of the rock product industries the expense of handling a large volume of waste must be added to the production cost. In dimension stone quarries the waste consists of defective material, irregular fragments and chips; in the rough stone industries most of the waste consists of fines. Excessive waste through imperfections may be avoided by careful prospecting, and by working the stone in such a way that the largest possible masses may be obtained free from defects. The production of excessive fines may be due to the nature of the rock or to the type of crushing machinery.

Jaw crushers are finding favor in many plants because it is held that they produce a minimum of fines. While various outlets for waste are available, in general the quantity produced is in excess of that utilized. Consequently the problem of reducing the proportion of waste is of first importance.

Development of Byproducts

Though well-equipped plants may operate on high-grade deposits, there is usually a certain percentage of unavoidable waste. Human ingenuity is continually seeking new ways of utilizing material that cannot be employed in the manufacture of the main product. In many industries byproduct development has been the means of averting bankruptcy. In this field rock product operators have much to learn.

In the lime industry thousands of tons of pure limestone in sizes under 4 in. are thrown on the dumps every day, because modern shaft kilns cannot operate properly with fine materials. A wider use of rotary kilns, or changes in the method of operating shaft kilns, may help to solve the problem, but in the meantime the development of a market for agricultural limestone, road stone, flux, chicken grit, or pulverized limestone as filler would assist greatly in utilizing a high-grade product now almost entirely wasted.

Slate manufacturers are broadening their market for pulverized waste slate as filler, and many granite workers, particularly in the Middle West, are finding an advantageous outlet for spalls and waste blocks as crushed stone for state road work. The Vermont Marble Co. has erected a large lime plant at West Rutland to make profitable use of the waste marble from the extensive mines and quarries in that dis-

trict. The field for such developments is almost unlimited, and every new type of byproduct that appears represents an important step in cost reduction.

The Keeping of Costs

Disastrous price cutting that has driven operators to a frenzy, and has temporarily paralyzed some industries, is due in some instances to ignorance on the part of producers who keep very imperfect records, and who unknowingly sell below cost. Every operator should keep a close record of costs as a basis for determining a proper selling price.

There is, however, another very important function of cost-keeping that is commonly overlooked. Every rock products manufacturer should be ever alert to increase his efficiency so that production costs may be gradually reduced. The cost of individual operations is a measure of their efficiency, and there is no way of checking relative efficiencies without recourse to cost records. Technical cost-keeping is therefore an urgent necessity. It is safe to assume that many methods of operation now in common use would be hastily abandoned if reliable records were kept showing the excessive burden of expense involved in their employment.

Simple Systems Needed

Accounting systems of great complexity are not desirable. A system should be devised by men who are familiar not only with bookkeeping but with the rock products industry. All that is required is a system of records that will indicate with a fair degree of accuracy the cost of each important step in quarrying and manufacturing rock products. Blasting efficiency can be improved only where records are kept of such items as drilling and explosive costs, and the tonnage of rock moved per pound of explosive. The relative cost of hand loading and steam shovel loading may be determined only through records of interest, depreciation, repairs, fuel and labor involved in the use of each process.

The Need for Association Work

Some manufacturers in every important industry build a wall of secrecy around their plants, and refuse any sort of co-operation with others in the same line of work. Some rock products manufacturers maintain this policy, but fortunately the great majority of operators in the stone industries are fully aware of the great benefits that may ensue from co-operative effort.

In the old days each individual operator competed aggressively against his neighbor operator, and, while this condition still prevails, there is gradually opening up a wider field of competition, that of an entire industry competing against other entire industries. Thus the slate-roofing manufacturer is not competing merely with other slate manufacturers but with producers of all other types of roofing, and the marble quarryman finds that granite, limestone and slate manufacturers are active competitors.

Accordingly there is a growing tendency for manufacturers of each commodity to unite in an association for the improvement of their industry as a whole. By such means they are enabled to discuss economies in production, the establishment of uniform cost systems, the attainment of more favorable freight rates, or the extention of their markets through collective advertising. This enables the industry as a whole to meet more favorably the competition of substitute materials, and thus the united effort results in individual benefits. Unfortunately some trade associations have violated the law, but this is only another example of a good instrumentality being turned to evil use.

The field for legitimate activity is very broad, and association work is to be highly commended as an avenue for improved acquaintanceship, increased efficiency, and reduced production costs.

How the Anaconda Disposes of Its Slag

IN a recent issue of the Anaconda publication, *The Anode*, the method of disposing of the slag from the reverberatory furnaces is described. All of this slag is granulated with water, the largest slag particles being about ⅛-in. in diameter. The slope of the main slag launders is ⅝-in. per foot, this being the minimum grade on which the slag will flow with the amount of water available. The launders are lined with cast-iron liners part way, and then with cast-slag liners the remaining distance. At the end of the discharge launders are placed two pits, approximately 90 ft. long and 40 ft. wide. While one pit is filling with slag, the other is draining and being excavated.

Two tracks parallel the pits; one is for the crane that does the excavating and the other for the train that takes the slag to the dump. These tracks are about 10 ft. above the top of the pits. Loading is done by a 30-ton electrically driven locomotive crane with a 3 cu. yd. clamshell, handling a load of 3½ tons every 30 seconds. The train consists of a 45-ton electrically driven motor operating from a third rail inside of the track, hauling four 20 cu. yd. side-dump cars, each with a capacity of 25 tons of slag. One trip is made every 15 minutes, and the daily capacity is 4500 tons.

A Jordan spreader with a side-arm reach of 15 ft. is used to spread the slag away from the track as it accumulates after dumping. The plow arms are operated by air, furnished by the locomotive that pushes the plow. Four trips with the plow are necessary to level the slag after each dumping.

When the slag has reached a point about equal to the reach of the spreader, the track is moved by hand, the new level being somewhat above the old each time, to increase the capacity of the dump. The present slag dump is filling up on top of the old slag which was run out and sluiced away by gravity prior to 1916. The fill at the present time is 100 ft. deep at the deepest spot. There is capacity for some years to come.

Erie Shovel Co.'s Prize Contest on Costs

"HOW much does it cost to run a steam shovel?" is a question to be settled by the prize contest recently announced by the Erie Steam Shovel Co., Erie, Pa. The company expects to render a real service to owners of excavating equipment by getting together many actual maintenance cost records and publishing them in detail. Prizes to be awarded in this contest for the best upkeep records. There are twenty prizes, ranging from $100 and a Waltham watch for first prize, $50 and a Waltham watch for second prize, down to $5 for the twentieth prize. In addition, $5 will be given for every record that does not win a prize, but is published.

Contractors have from time to time accused equipment manufacturers of too much optimism in giving out figures on maintenance costs. This company, however, has used a great deal of restraint in publishing upkeep records, to avoid leading steam-shovel owners generally to expect too much accomplishment with only an average field organization—and now they propose to remove all doubt about actual upkeep costs.

The judges will be Arthur S. Bent of Bent Bros., of Los Angeles, Calif.; Halbert P. Gillette, editor of *Engineering & Contracting;* and A. C. Vicary, vice-president of the company, mechanical engineer, with many years of specialized experience on steam shovel work.

This contest will continue until December 31. Records may be sent in by steam-shovel owners, managers, or any employe in direct contact with steam-shovel work. In every case, however, the record must be accompanied by a written statement from the owner of the machine to the effect that the figures submitted are correct to the best of his knowledge. The record should include approximate number of days the machine has worked, yardage moved, and class of materials, and all upkeep costs exclusive of cable, dipper teeth and grate bars. Complete information concerning this contest can be secured from the company.

Basic Slag Losing Out as a Competitor of Rock Phosphate

The new steel-making process has reduced the plant food content, only one American steel manufacturer now producing a high-grade basic slag

THE production of basic slag in the United States does not influence to any marked extent our supply and costs of phosphates, says J. G. Lipman, chief of the New Jersey Agricultural Experiment Station, in *Pennsylvania Farmer*. Only one of the American manufacturers of steel is producing a high-grade basic slag.

The importations of basic slag, which for a number of years before the war had been showing fairly marked growth, have been largely discontinued. For the time being, therefore, the cost and character of basic slag may not be a matter of any interest to American farmers. On the other hand, basic slag still plays an important role in determining the price of phosphates in the world's markets.

Europe is still a large consumer of basic slag and insofar as basic slag is employed the demand for acid phosphate is lessened. European farmers recognize that for top-dressing pasture land or for the production of fruit basic slag has distinct value. Moreover, improved processes for the manufacture of artificial basic slag are a possibility and an increased supply of basic slag at a low price both in Europe and in North America may bring the subject of basic slag in a more prominent way before the American farmer.

The New Process Changes the Value

For many years live stock farmers in England have considered basic slag as the most valuable and important manure for the improvement of their pasture. Because of its basic character it helps to conserve the lime content of the soil and, when properly used, prevents the land from becoming acid. It encourages the growth of white clover and improves the character of pastures and grass lands. This will explain to us why basic slag is held in such high esteem by farmers in the British Isles and on the continent of Europe.

It happens, however, that about a dozen years ago an improved process for refining iron ore was introduced. This is known as the Basic Open Hearth Process. It is becoming popular among the manufacturers of steel because it is not only more economical than the Basic Bessemer Process, but has the further advantage of allowing the use of the lower grade ores. The slag manufactured by the older processes usually contains about 18 per cent of the phosphoric acid in a fairly available form. The basic slag made by the newer process contains from 7 to 15 per cent of phosphoric acid and usually in a form less available. Chemical tests show that the phosphoric acid in the slag made by the Basic Bessemer Process is 90 to 95 per cent available by the so-called citric acid test. The slag made by the Basic Open Hearth Process also shows a high degree of availability even though its content of total phosphoric acid is lower. Some of the manufacturers produce what is known as open hearth fluorspar slag. This contains from 7 to 15 per cent of total phosphoric acid, but the availability is much lower, ranging from 6 to 50 per cent by the citric acid test. It is evident, therefore, that the purchasers of basic slag in England are no longer as certain as they have been in the past as to the value of slag employed by them for the improvement of their pasture lands and for other purposes.

Testing Sources of Phosphoric Acid

The situation just noted has led the boards of agriculture and experiment stations in England to institute a number of tests with different kinds of slag. In these tests there have also been included various ground raw phosphate rocks. Ground phosphate rock from North Africa, from the United States and from Oceania have been compared with basic slags made by the different processes. Several experiments were started in the county of Sussex in 1915. Meadow land that had not received any fertilizer treatment was selected for the tests. Plots of one-quarter acre each were laid out on land that had been in grass for some time. There were employed basic slag produced by the Basic Bessemer Process, Basic Open Hearth Process and the Basic Open Hearth Fluorspar Process.

The other materials included in the test consisted of Florida pebble phosphate and likewise phosphate derived from Tunis, Algiers, Egypt, and Cambridge, England. Additional plots treated with acid phosphate alone, lime alone and with combinations of lime and acid phosphate were provided. Applications of phosphate were made in the period December to February. The quantity applied was equivalent in each case to 200 lb. of phosphoric acid per acre. The hay crop in each plot was harvested and weighed and the weights recorded.

Comparing the Results

Three distinct soil types were represented in these tests, namely, London clay, boulder clay and chalk. Aside from the experiments just noted, tests were also carried out in northern Ireland. Here the conditions were different both as to climate and soil type, and phosphates were used alone or in combination with manure. Without going far afield in discussing the results obtained in these experiments, certain outstanding features may be noted. It was found that open hearth fluorspar basic slags did not give as good results as the slags showing a high citric acid availability. This was to be expected, since the citric acid tests were developed gradually on the basis of actual field returns.

It was found that these fluorspar slags possess distinct value even though their phosphoric acid is not as available as it is in the other types of slag. Seasons of high rainfall and soils that are distinctly acid may show almost as good response from fluorspar slags as they do from the Bessemer slags. On the other hand, under conditions of limited rainfall and on soils possessing a lower degree of acidity these slags are decidedly inferior. Ascribing to the lower grades of slags a value of 100 per cent the fluorspar basic slags would possess a value of from 50 to 70 per cent for the fertilizer of grasslands.

As to the rock phosphates, the conclusion seems to be that for the improvement of grass lands under conditions in Great Britain and Ireland ground phosphate rock possesses a higher value than was formerly supposed. The acid soils show particularly a marked response to applications of ground phosphate rock derived from North America or North Africa. The African Gafsa phosphate seems to be the

most acceptable type of ground phosphate rock for direct application. The conclusion is that where the rainfall is low the more soluble types of the African phosphates, like those coming from Gafsa, Egypt, Algiers and Tunis, are superior to the richer but at the same time harder and less soluble Florida pebble phosphates.

The Demand Is Increasing

Since the ending of the war the demand for basic slag in England has rapidly increased. The consumption of 400,000 to 500,000 tons per annum is indicated. On the other hand, the production of basic slag has not kept pace with the increased consumption. In the pre-war years the production was about 400,000 tons per annum In the years 1919-1920 production increased to about 700,000 tons, but fell again to 400,000 tons in 1920-21. This reduction in output, taken together with the inferior quality of the new types of rock already referred to, is affecting fertilizer costs and practice in England.

This, as already noted, is bound to react on the phosphate market in the United States as well as in other places. The agricultural organizations in England are concerned with the matter and are paying a good deal of attention at this time to the production of basic slag, to its quality and to the character of imported basic slags and their costs and to the possibility of increasing the production of basic slag. Much study is being given to the comparison of different types of slag.

Proposed Constitution of Sand and Gravel Association

AT the special convention of the National Association of Sand and Gravel Producers, to be held at the La Salle hotel in Chicago on November 15, at 10 o'clock, action will be taken on changes in the constitution and by-laws.

This is the new constitution and by-laws:

PROPOSED CONSTITUTION AND BY-LAWS OF THE NATIONAL SAND AND GRAVEL ASSOCIATION

ARTICLE I—NAME

The name of this organization shall be The National Sand and Gravel Association.

ARTICLE II—OBJECTS

The objects of this association shall be:

To promote and extend the use of the products of the industry.

To provide an organization for the co-operation of the members and the co-ordination of their efforts with those of other trade associations and with governmental agencies in the furtherance of all projects affecting the industry.

To establish and to maintain the highest standards of business practices, customs and usages among its members, and to protect the interests of the industry.

ARTICLE III—MEMBERSHIP

Section 1. Any person, firm or corporation of the United States or Canada, engaged in the production of any mineral aggregate, shall be eligible to membership in this association.

Section 2. Application for membership shall be made in writing to the executive committee, pledging allegiance to the association and agreeing to abide by the constitution and by-laws and pay the dues assessed.

Section 3. The resignation of a member shall not be accepted nor liability for dues ended unless written notice of such intention shall have been submitted to the executive committee six months previous to the effective date thereof.

ARTICLE IV—ADMINISTRATION

Section 1. Officers—The officers of the association shall consist of a president, a vice-president and a secretary-treasurer, who shall be elected at the annual meeting of the association to serve for one year, or until their successors are elected.

Section 2. The duties of the president and vice president shall be those customarily performed by such officers. The secretary-treasurer shall be the custodian of the funds of the association and shall disburse the same upon the approval of the president or executive secretary. He shall provide an indemnity bond satisfactory to the executive committee, the expense of which shall be paid by the association.

Section 3. The management of the association shall be vested in a board of directors. One director shall be chosen by the members of the association in each district hereinafter provided for at least 30 days before the annual meeting of the association and in such manner as the membership of these districts shall determine.

There shall also be three directors at large, elected by ballot at the annual meeting of the association.

The members of the board of directors shall serve for one year or until their successors are chosen.

In order to insure the selection of a representative board of directors and to facilitate the administration of the affairs of the association, the United States shall be divided into districts composed of contiguous territory, the original number and boundaries of such districts to be determined at the annual meeting at which this constitution is adopted. Subsequent changes may be made in the number or boundaries of the districts by the board of directors.

Section 4. The board of directors shall choose from their own number five members who together with the president and secretary-treasurer of the association shall constitute the executive committee, which shall actively conduct the affairs of the association and carry out the specific plans of the board of directors in the interim between the meetings of the latter body.

Section 5. The executive committee shall secure the services of an executive secretary who shall act under the direction of said committee. The executive committee may authorize the executive secretary to secure such facilities, assistance and services as may be necessary to carry out the purposes of the association.

Section 6. The president, by and with the advice and consent of the executive committee, may appoint such committees as may be deemed necessary to carry out the purposes of the association.

Section 7. The compensation to be paid to the executive secretary and the members of his staff shall be determined by the executive committee. All officers, members of the executive committee and board of directors shall serve without compensation. The necessary expenses incurred by the officers and members of the committees while attending regularly called committee hearings, other than those which may be held at the time and place of the annual meeting, shall be paid from the funds of the association when approved by the executive secretary and president.

ARTICLE V—MEETINGS

Section 1. There shall be at least one meeting of the association per annum, the date and place to be fixed by the executive committee, notice of such meeting to be mailed to the members of the association 60 days prior to the holding thereof.

Section 2. Special meetings of the association, board of directors or the executive committee may be called by the president at any time upon due notice.

ARTICLE VI—NOMINATIONS AND ELECTIONS

Section 1. The board of directors selected for the ensuing year shall be constituted as a committee to place in nomination on the first day of the annual convention, at least one member for each office or place on the board of directors.

Section 2. Any five members of the association may make additional nominations by filing the same, in writing, with the executive secretary in advance of the election.

Section 3. The directors at large shall be elected at the annual meeting by ballot.

Section 4. A vacancy occurring in the offices shall be filled by the executive committee.

A vacancy occurring in the executive committee shall be filled by the board of directors by referendum vote or otherwise.

A vacancy occurring in the board of directors shall be filled by the president until such time as a successor is chosen by the district in which the vacancy existed.

ARTICLE VII—DELEGATES AND VOTING

Section 1. Each district shall be entitled to select five delegates and five alternates to represent the producers of that district at the annual meeting.

Section 2. Each delegate or his alternate shall be entitled to one vote.

Section 3. Any member of the association shall be accorded full privilege of the floor at the annual convention.

Section 4. Any question may be submitted to the board of directors or the membership by referendum vote when deemed advisable by the executive committee.

ARTICLE VIII

Section 1. The board of directors shall propose a plan covering the activities of the association for the ensuing year, and submit a budget covering the expenses incidental thereto.

Section 2. The funds of the association shall be secured by an assessment based on the total tonnage output of each member for the previous year. The rate in mills per ton shall be determined by the board of directors at the annual meeting.

Section 3. All assessments shall be due and payable in regular monthly installments. The invoice covering the first month's assessment shall include an annual subscription of $2 to the "National Sand and Gravel Bulletin."

Members admitted to the association after the first of the calendar year shall pay the proportion of the assessments due following the date of admission.

ARTICLE IX—AMENDMENTS

These articles may be amended at any regular meeting of the association by a two-thirds vote of the delegates present and voting; no amendments shall be considered at any meeting unless a written notice of the changes proposed shall have been given to the executive secretary at least 30 days previous to such meeting, and unless written notice of such proposed change shall have been mailed to members at least 15 days prior to such meeting.

A Special Convention

THE NATIONAL ASSOCIATION OF SAND AND GRAVEL PRODUCERS will hold a special convention at the La Salle hotel in Chicago, Ill., November 15, at 10 o'clock, to take action on proposed changes in its constitution. These changes will make for wider usefulness and co-ordination of the association's efforts, and a representative attendance of the industry is especially to be desired.

Increased Demand for Cars

THE demand for freight cars in excess of the available current supply amount to 156,309 cars on October 15, according to reports just received from the railroads of the country by the Car Service Division of the American Railaw Association.

The shortage in box cars amounted to 77,111 cars, an increase of 6048 within a week. The shortage of coal cars totaled 44,984, or an increase of 4485 within the same period.

British Quarry Practice

By W. Shaw*, Hillhouse Quarries

The author has not spared British quarry practice, but in extenuation he says that "Unless some one uses the knife to bare the sore, there can be no hope of a cure"

I MUST confess I was very reluctant to appear here to read a paper on quarrying, handling and breaking limestone. I have been doing my very best for over a quarter of a century to acquire some knowledge of the business, but the older I become the less I seem to know about it. You can guess, therefore, that I am not here of my own free will. I tried every move I know to wriggle out, but your secretary checkmated me every time; any apology which may be due for my shortcomings must, therefore, be made by him.

Having placed the responsibility on the proper shoulders, I feel free to talk about the subject as I would have done 20 years ago, when I thought I knew all about it. I may shock you with some of my statements, but if I do, please remember that I am not the responsible person.

To begin with, I will venture the statement that, taking quarrying as a whole, there has been more money lost than was ever made in the business. I cannot prove that statement, but I think those who have studied the question and kept their eyes and ears open when travelling the country, will agree with me. The reasons are not far to seek. In the first place, quarrying is a speculative business; Nature sometimes plays us a grim joke by exposing a beautiful piece of rock and hiding the rubbish behind.

Secondly, human stupidity is sometimes to blame in opening up quarries and laying down a plant only to find afterward that transport is not available.

As a third instance, I personally know of an enormous loss simply because the building of houses with stone was replaced by brick and rough cast.

Fourthly, I think I am safe in saying that the greatest number of failures are due to bad management. At one time any kind of person was supposed to be able to manage a quarry. I know of cases where managers were appointed who had never seen a quarry, and yet the people who had put up the money could not understand why the quarry did not pay.

One result of these repeated failures is a loss of confidence. Banks that will advance money to most industries without security draw the line at quarries. The business is therefore friendless and stagnant, or nearly so; it is going to remain there until those who are responsible bestir themselves and prove that quarrying can be made a safe investment. This in a great many cases can be done by casting aside tradition in which most old quarrymen are steeped, especially in those districts where the industry has been carried on for centuries.

There is no more difficult thing than to induce an old quarryman to change his methods. He goes on with the firm conviction that his way is the best; this is a most happy state of mind to be in, but it does not pay.

The quarryman or quarry manager who feels certain that his way is the best and only way, is due for transference. The best method of doing anything has yet to be discovered, and a good manager will never stop looking for it. Too often have we all thought we had discovered what we considered was absolutely the best way to find in a few months that there was still a better. The man who keeps looking for the best methods will never be troubled with what is vulgarly called "swelled head." He will be reminded every now and then how little he does know.

Well, what we are concerned with today is to state what we consider to be the latest and best methods of quarrying, loading and breaking limestone for fluxing purposes. A good deal of what will be said will equally apply to road-stone.

Proper Blasting Needed

The first part of the process is quarrying, which I take to cover drilling, blasting, barring-out and breaking down the stone to suit the crushers. I think you will agree that the cost incurred in this work will make a quarry either a success or a failure. Naturally the air of the manager is to get the stone on to the quarry floor with the minimum labor and in pieces as small as possible; this can only be obtained by proper blasting. Blasting rock is a subject which has not received the attention it deserves in this country. Compared with the United States, we are still, comparatively speaking, in the dark ages.

Some years ago I was asked to report on a quarry producing limestone for fluxing purposes; their method of blasting out the rock was to put down one hole about 30 ft. deep. As this hole was too small at the bottom to be of any use, it had to be sprung three or more times, and, of course, work in the quarry had to be stopped at least 15 min. on each occasion. When the hole was finally fired it pushed out the stone in large blocks, and these had to be shot over and over again before the men could tackle them with hammer.

The manager—a real old-timer—had never seen any other method and would not listen to any new-fangled ideas on the subject. The multiple system had, however, to be tried, with the result that from 60 to 70 per cent. of the stone thrown out by the primary blast was suitable to load direct into wagons. I need hardly tell you, gentlemen, what difference it made in the costs, but it was sufficient to turn a losing concern into a paying one. That was a fine example of a manager with a contented mind. As he had been blasting in the same way for many years the amount of money lost must have been considerable.

It is not enough, however, to apply the system and let it go at that. Each manager must ascertain for himself what spacing and depth of holes is most suitable in his particular case. Multiple blasting by beds, while a great improvement on the single hole method, has certain very serious disadvantages. There is always a great amount of labor attached to clearing off the benches to allow the net set of holes to be bored, not to speak of the danger of shattered stone falling on the drillers. The very latest best way, as practiced in the United States, is to blast the whole depth of the face in one operation. The ideal height of face for this method of blasting is from 60 to 70 ft., but the Americans carry it out in practice up to 150 ft. I have seen a face of trap rock 1,000 ft. long, 70 ft. high and 20 ft. thick thrown bodily out, ready for loading. It seemed to me that blasts of this nature produced more rock suitable for loading without further labor than any method I had ever seen.

The cost of explosives for a blast of this nature will work out at about 1½d. per ton (about 3 cents). In those places where this method has been adopted, in combination with steam shovel loading, quarrymen, as we know them, are not to be found.

The tripod drill used in this country is

*Mr. Shaw's paper was read before the Institution of Quarry Managers, North of England District, at Darlington recently.

no use for the system unless to put in a few breast holes required. Well drills which will put down a 6 in. diameter hole the full depth are necessary.

An Impossible Theory but Common in Practice

There is also the question of misfires in multiple shots which cause considerable expense and danger. I am alluding to cases where some of the holes are fired and others in the same series miss. This, in theory, is impossible, but in practice it is a very common occurrence.

The most feasible explanation of this is that the internal resistances of the detonators vary and those having a low resistance detonate before the others, and, of course, break the circuit. When firing a multiple shot, therefore, all the detonators should be as nearly as possible of the same resistance. There are, however, other important factors which I am presently investigating.

I would also like to draw your attention to the class of explosives used. I don't know the practice in this part of the country, but in some quarries in England producing fluxing stone powder is still used —a relic, I suppose, of the time when these quarries were producing block or building stone.

It is surely reasonable to expect that a high explosive will break up the rock better; the best strength to use depends upon the class of rock.

Americans, when blasting the full depth of the quarry, may use two or three different strengths in the same hole; that is, of course, only done when the beds vary. One bed may be charged with 60 per cent blasting gelatine, another with 40 per cent, and so on. Every manager requires to find out by actual experience what strength of explosive is most suitable. I think I have said enough to show that blasting is not the least important item in securing low costs of production.

Loading, Hauling and Crushing

The next part of the process with which I shall deal is loading, hauling and crushing. The common practice in this country is to load by hand. With loading I shall include breaking down the stone to suit the crusher, because both should be done by the same man. The amount of labor entailed in breaking down the stone will vary in every quarry even after the best means of shattering the stone by blasting is discovered. The actual loading can be done very cheaply with proper arrangements. The first essential point is that the loader should never require to leave his place; he should never require to touch a wagon and he should never be without an empty wagon.

It should be impossible to block the railway with wagons being loaded by slower men or men handling stone more difficult to load. In this respect it is advisable that each loader should have his own working place, and be paid either on a piecework or tonnage basis, or on fixed wages plus a bonus on everything produced over a predetermined fixed output. Few men will do their best unless when working on their own account; even when they are allowed to choose their own partners the output goes down. I have tried all methods, and that is my experience. It is a very human characteristic when you think of it; no two men are equal, and the better men will not, as a rule, do more than they are paid for.

In considering the type of wagons, these should be low and designed for partial loading with the mouth tipped toward the loader; this will enable him to load about two-thirds of the full quantity without straightening himself. There is nothing distresses me more than to see a man reaching up to high wagons and carefully arranging the stone as if he was building a wall. While he is doing this he could put two or three stones into a wagon such as is described. Further, stones which could be easily lifted into a low wagon, would otherwise require to be broken again.

All the conditions stated are possible in most quarries, and I think you will agree that if by their adoption the output of each man can be doubled, they are worth striving for. The wagons should be hauled up an incline to the crushers and be returned by gravitation. In this way one man or boy with a simple haulage can handle easily 300 to 400 tons per day.

A very common error is to run the incline the opposite way to that recommended here, so that loaded wagons will gravitate to the crushers. The empty wagons must be returned to the face by some means much more expensive than an ordinary haulage.

I saw a place quite recently where those responsible had spent a considerable sum of money to allow the loaded wagons to gravitate to the crushers, and in this case the loaders were running down and pushing back their empty wagons. It was no use pointing out that if these people had kept their natural advantages, they could, with the aid of a small winch, have had the same output with about half the men. That is the sort of thing there is no excuse for—it is sheer stupidity.

A 30x16-in. breaker will crush 400 tons per day of hand-filled stone down to 5-in. size, and will feed itself. It is what Americans would term a one-man machine; that is, it will take a wagon of stone broken down to sizes that can be lifted by one man. A smaller machine simply means more melling at the fact and frequent blocks at the crusher, as the men will occasionally and in spite of orders slip in stones too large; I expect you have all experienced this drawback. Just think of the unnecessary labor being used in this country at the present time, in breaking down stone at the quarry face to suit the average crusher; thing of the stoppages on account of these crushers being fed with stone too large for them, and of the numbers of men employed in feeding these crushers. The loss must be enormous.

You will understand that up to this point I have been referring to quarries with daily outputs not exceeding 300 to 400 tons; also that I have personally gone through every phase described except that of running the incline the wrong way. I have, however, had the expereince of reversing that system in several quarries with the most happy results.

We now come to quarries with daily outputs of over 300 to 400 tons. There are not so very many single quarries of this class in Britain, and I suppose that is one reason why nothing much has been done in introducing labor-saving appliances.

It Was Not "Yankee Bounce"

When I first read of quarries in the United States producing 3,000 tons daily with 90 men, I simply put it down to what we in our ignorance term "Yankee bounce." I am very thankful I did not hear about the limestone quarry in the Middle West which produces 10,000 tons daily, until after I had actually seen those producing 3000 tons. There is no doubt that if we want to learn how to handle stone on a large scale we must go to America to be taught. No doubt there are several good reasons why the Americans are so far ahead of us in this respect. In the first place, they are not hampered by tradition; the enormous rock cuttings in connection with their railways forced them to search for tools suitable for the work, and especially labor-saving tools, as these cuttings were generally in places where labor was scarce and consequently expensive. Again, if a man does "come a cropper" through trying new methods, he only requires to move to the adjoining state and commence anew. Americans, therefore, can and do take risks, but it is only by taking risks that progress can be made.

"Must Go to America to be Taught"

We in this country can never hope to equal them regarding their outputs, as the country is not large enough for such demands. This, however, is no reason why we should not apply their methods wherever they are practicable.

I have already described their blasting methods, which, by the way, can be applied to almost any size of quarry.

I shall now deal with loading by means of the steam shovel and with the use of large primary crushers, as I have personally proved that they can be successfully worked in this country. I can assure you that I was very skeptical about using a steam shovel for handling hard, tough stone like that taken from Hillhouse quarries, and it needed the great war—when men could not be obtained at any price—to make me try one. The advent of the shovel completely upset all our cast-iron ideas. That was one good turn to start with, although we did not like it at the time.

(To be continued)

Hints and Helps for Superintendents

Controlling Truck Haulage by Time Cards

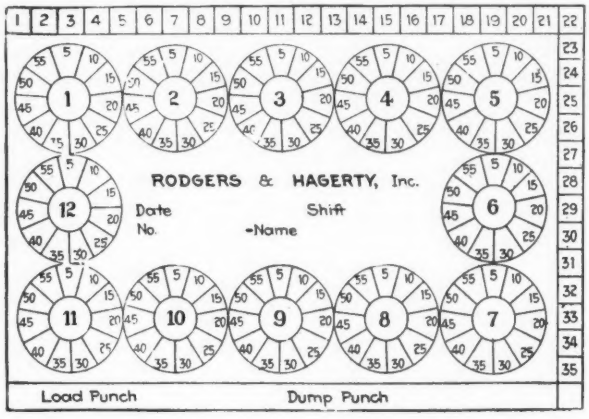
CONTROL of motor trucks handling material excavated for pier foundations for the Hill to Hill bridge at Bethlehem, Pa., was effected through a simple though very efficient use of time cards. This bridge spans not only the Lehigh river but four principal railroads, the Lehigh Canal and Navigation Co.'s canal and seven streets. Though the main structure is only about 2,000 ft. long with its three approaches and its four approach ramps this length is extended to about 6,000 ft. It is of reinforced concrete with piers of massive design and its spans range in length from 100 to 150 ft. center to center of piers.

In excavating at the piers it was necessary, because of the narrow right-of-way given the contractor, to dispose of the material as it was excavated. Eighteen motor trucks were used to transport it from the pier sites to the dump, an average haul of a quarter mile from the bridge. The contractor organized a separate trucking concern and appointed a manager to oversee the work of the 18 trucks that were kept in practically continuous operation.

The foremen on the job were required to tell the manager of the truck department every evening what the truck needs for the next day would be. The value of beginning to operate trucks early in the working day was realized, so no truck was allowed to go on the job after 10 o'clock in the morning. This induced all job foremen to size up their needs of each succeeding day at the end of the day's work.

Actual control of truck movements was effected by the use of the time card reproduced here. The circles represent hours of the day. The line of numbers at the top and right of the card was for noting the number of trips made from the loading point to the dump. The cards were used as follows:

At each loading point and at the dump were checkers with punches that identified them with particular places. The driver of each truck was given one of these cards as he left the garage in the morning. When he arrived at the loading point the man there with the punch punched opposite "Load Punch" on the card and then the hour and minute of the driver's arrival. As the driver left with his load the man at the loading point punched out the first figure in the horizontal line of figures indicating that the driver had left with his first load. When the driver arrived at the dump the man there left his distinctive punch in the space opposite "Dump Punch" and then also punched the hour and minute of the driver's arrival at the dump. This process was repeated with each trip.



Time card for motor-truck control. By punching the dial at the loading point and dump an accurate time check is kept of all truck movements. The horizontal and vertical figures record the trips per day

At the end of the day it was possible to check the activities of each driver by looking over his time card. The number of trips made was therefore indicated both on the hour and minute circles and in the horizontal and vertical columns. If the driver's card showed fewer trips than the average for all trucks both he and the manager of the truck department were called on the carpet.

Besides the trucks on regular runs several were used from time to time for miscellaneous jobs. To record the movements of such trucks another report was made out by the driver. That type of report is also reproduced.

In actual excavation a small steam shovel was used first before any sheeting was placed. After digging down about 10 or 15 ft. bracing and sheeting were placed and the rest of the excavation was done by clamshell, handling the material direct from the pier to the trucks without any intermediate dumping board. All the material was taken to one dump. The excavated material is to be used in backfilling; and it is probable that considerable borrow will be used in addition.

The bridge is being built by the Pennsylvania Public Service Commission under the local supervision of the Bethlehem Bridge Commission. Clarence W. Hudson, New York, designed and is supervising the erection of the bridge. Rodgers & Hagerty are the contractors, with W. Caccia in charge as resident engineer, and George Angel as general superintendent.

HILL-TO-HILL BRIDGE CONTRACT — BETHLEHEM, PA.

DAILY TRUCK REPORT

DATE — WEATHER

	TRUCK NUMBER	CHAUFF NAME	FROM WHERE	TO WHERE	MATERIAL HAULED	LOADS	TRUCK TIME	OILS	GAS

REMARKS TO BE LISTED ON REVERSE SIDE.

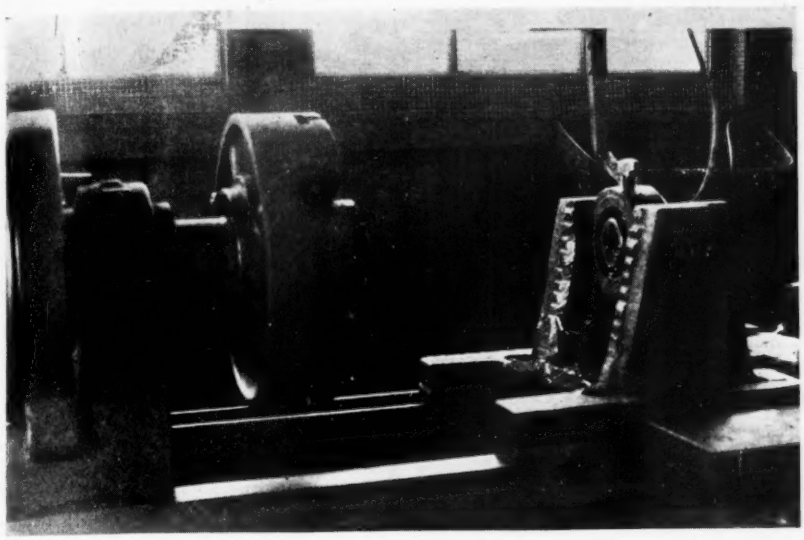
Forms used on miscellaneous haulage. No check was kept on the individual consumption of the oil and gas. The total bills for these items were prorated monthly among all trucks continuously operating

Threading Bolts on a Lathe

WITH the aid of an old derrick sheave frame, the lathe in the machine shop of the Universal Sand Co., New Castle, Pa., was converted into a bolt threader which is practically as effective as a machine designed for that purpose.

As may be seen in the illustration, a derrick sheave frame was mounted upright on the lathe so as to have both wings upward. In either side of the sheave, ¾-in. holes were drilled, tapped, and a setscrew put in. A collet of the size of the die handstock was made, with depressions in either side to accommodate the points of the setscrews. This collet was then mounted between the sides of the sheave by setscrews. The collet was provided with a setscrew to hold in place the desired size of die and the die and collet placed at the same height as the revolving end of the lathe.

In this way, a bolt secured in the revolving end of the lathe may be threaded in a minimum of time and energy as compared to the method by hand power. The



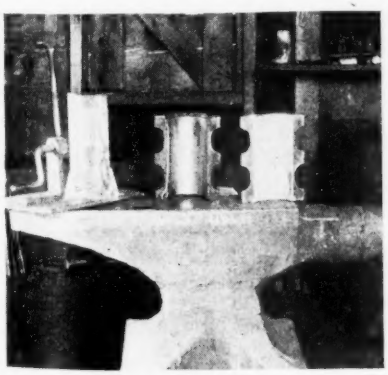
Bolt-threading attachment on lathe, showing it ready for use

placing of an additional pulley on the overhead drive-shaft was necessary to make possible reversing the lathe and remove the die from a finished bolt.

Making Dump-Car Bearings Good as New

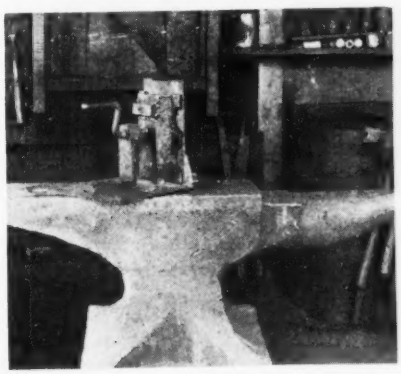
HERE is a homemade device which makes easy the task of rehabilitating wornout bearings. This device, shown in the accompanying illustration, was made to use in restoring the bearings of Western 4-yd. dump cars, but principles of this design can be equally applied to any size of beairng desired.

In making up the device great care was taken to insure the proper dimensions of the



The "rebabbitting" machine is on the left; in the center is a worn out bearing, and at the right a bearing which has been rebabbitted

shaft on which the bearing is used. This pattern is riveted horizontally and at one end of the base, which is a ⅜-in. plate, 5 in. wide and 8 in. long. To the other end of pattern, which represents the radius of the base, is riveted a ⅝-in. strap, 2 in. wide and 8 in. long, bent to a 45-deg. angle and placed opposite the pattern at the other end,



A bearing in the device ready to be rebabbitted

to permit a crank-operated setscrew to be turned.

With this device, a worn-out bearing may be placed against the pattern and the screw turned up until it presses against the bearing and holds it in place while the babbitt is poured.

This "machine" was made by one of the employes of the Universal Sand Co., New Castle, Pa., and has been in use for the past five years. In that time the company has not bought new bearings for the cars, as a surplus supply of made over bearings is always on hand.

A Good Use for Wornout Shovel Dipper Teeth

IN the accompanying illustration is shown the way in which the Consolidated Stone and Mining Co., Wampum, Pa., is making use of old steam shovel dipper-teeth points.

In this instance two teeth were placed together edgewise and bolted in the center of a stone chute leading to a gyratory crusher, with the points upward. They thus serve as a divider to the flow of stone, causing it to move in two courses, each going directly into either side of the crusher.

This method does away with the usual

Wornout dipper teeth divide the stone flow and prevent rehandling from overflow

rebounding of stones, which gave an untidy appearance to the floor about the crusher.

Agricultural Engineers to Meet in St. Louis

THE sixteenth annual meeting of the American Society of Agricultural Engineers will be held at the Planters Hotel, St. Louis, on December 27, 28 and 29. An excellent program is being prepared and the plans under way give assurance of the largest and most successful meeting in the history of the society.

The Implement, Vehicle and Hardware Association of St. Louis, which extended the society the invitation to hold the annual meeting there, has appointed a committee to take charge of local arrangements and is co-operating in a very generous way to make the annual meeting this year a success. For further information about the meeting write Raymond Olney, secretary of the society, St. Joseph, Mich.

DON'T miss the special convention of the National Association of Sand and Gravel Producers at the La Salle, Chicago, on November 15!

Quarried from Life

By Liman Sandrock

He Listened to the "Other Fellow"

IF you consult your Century Cyclopedia of Names with the expectation of finding mention of the town of Newton, N. J., you'll be disappointed. True, Sir Isaac Newton and his law of gravitation loom large; there's Gen. John Newton, who blew up Hell Gate; there's several Newton divines who doubtless blew up their hell-gaited parishioners—but no N. J. Newton. Just the same, Newton, N. J., is on the map, and very much so.

How come? Because it's the abiding-place of the Limestone Products Corporation of America. We will not attempt to describe this really wonderful plant. You will find that well done elsewhere in this issue. But we do intend to say something pleasant about that plant's creator, Edward S. Bixler.

Mr. Bixler told us, somewhat reluctantly, that "we have had a merry time building and financing this big plant. It would take a long story to give you even a brief description of the many obstacles which confronted us from time to time. Have we ironed out the wrinkles? Say, to keep this young plant in good physical condition we will be forever using our iron."

Now for the personal side. Mr. Bixler was born on a farm near Springtown, N. J. While none of his ancestors figured in the rock products industry, the local atmosphere was making ready for its introduction, for years later the Alpha Portland Cement Co. built its first plant in Springtown, on his grandfather's farm.

Like many other successful men, Mr. Bixler was not blessed with a technical education or with a heap of this world's goods. But, what is bigger and better, he had the makings of the executive—wide vision, keen judgment, the ability to pick out trained men, the mind to analyze the other fellow's problems and profit by his mistakes—all of which is a fine nucleus for future success.

"To my mind," said he, "the lime industry is in its swaddling clothes, particularly in the agricultural field. Science, however, has proved that lime is one of the essentials of plant life. Every United States experiment station indorses it. Farm production depends almost entirely upon the fertility of the soil, and it is the application of the farmer's knowledge of what that soil requires which makes for its fertility.

"The five essentials of plant life are nitrogen, potassium, phosphorus, calcium, and drainage. With these elements properly understood and applied, Mother Nature will take care of the balance. But the fact must not be lost sight of that lime is *the* essential around which all the others operate; it is the foundation which must be supplied and maintained.

"Our organization here at Newton has sufficient faith in our pulverized material to believe that, with just a little educational work, our entire product will be absorbed within a very short radius of our new plant."

Edward S. Bixler, President of the Limestone Products Corporation of America

All of which is good medicine!

The very first million we save out of our salary as an editor we intend investing in a lime plant. When that comes about we'll adopt Edward Bixler's plan when building our plant. We'll travel all over the country first and see what the other fellow has accomplished; ascertain his mistakes and shortcomings; listen like the dickens to good advice; use what common sense God gave us—and then we'll spend a month in that Newton plant to finish our preliminary education—when we save that million.

In the meanwhile, we invite you to give heed to ROCK PRODUCTS' story describing the Limestone Products plant. In all likelihood, you will find something that will be to your decided advantage—something that we pass along to you for the good of the order, as it was passed along to us.

They Said It

A WILD DAY in Pierre: The Pierre (S. D.) *Journal* says that Rapid City's engineer had a "real thrill when, at the state plant, he poured the cement for the new factory."

SOUTH AFRICA has developed a new motor fuel from prickly-pear juice and chemicals. Our Department of Commerce is skeptical of its efficiency, however. Perhaps this fuel might develop prickly heat?

WE COMMEND the Compressed Air Society for its recent literature telling of the many applications of compressed air in the industries. Here's one: When stuffing sausage, "everything but the squeal" goes in quick.

OI, OI! At the expense of getting in dutch, we want to tell you that Bill Hohenzollern's civil marriage was performed by Burgomaster Baron Schimmelpenninck Van Der Oye. Oi, oi!

WE offer our apologies to the eminent Doctor Couie for publishing a contributor's version of the medico's uplifting slogan:

"Day by day, in every way,
We're getting wetter and wetter."

No, it is against our policy to forward addresses.

OUR Biological Survey is doing fine work in protecting our birds. All to the good so far as it goes, but— What is being done to protect us from the birds? We can now only be thankful that cows do not make their habitat on the skyscrapers.

IN DEFIANCE, OHIO, and in defiance of the statoots, Herb Perkins cooked up dead animals for fertilizer. Jedge Killey killed Herb's chances for further stench-raising by fining him fifty cold iron men. Better start a lime plant, Herb.

SOME SNAPPY STUFF: The Alma (Wis.) *Journal* says that "the farmers are chasing Mr. Soil Acidity up and down the coulees of La Crosse county. And limestone is the club."

OL' KING COAL will be a harried old soul when that live-wire Illinois Construction and Transportation Association Sikis him in the wind for hogging the open-top cars, to the exceeding detriment of the rock products industry. We personally know President Fred Murphy and Secretary Charley Mateer. They are fighters, and therefore the new association is in good hands. "We've been the goats the last four years," says President Fred, "and now the goats are going to butt—and butt hard."

Editorial Comment

Commerce In Ideas

The leading article in this issue of ROCK PRODUCTS describes what is probably the most up-to-date rock crushing and pulverizing plant in the world. This article contains two very significant statements: (1) "Before the plant was built Mr. Bixler (the president of the company) visited every stone and cement plant of note in the United States. (2) "He studied conditions and operations, carefully picking out the good things and profiting by the 'other fellow's' experience." In those two statements is a sermon in a nutshell.

This operator's method of solving his problems is almost unique because few men can spare the time and expense to travel around as he has done. The investment of a million dollars in the undertaking justified it in this case. But in the case of a thousand-and-one other operations the knowledge that Mr. Bixler got by travel and observation must be had less directly by the travels and observations and experience of others, as expressed in the printed page.

Mr. Bixler owes much to other operators whose plants he visited. Nowadays, such visitors are everywhere welcome. The *futility* of building a wall about a plant to keep every good thing from the knowledge of outsiders, or competitors, has long been demonstrated. Every modern industry, if it really is modern, has grown up through and with a free interchange of ideas, knowledge and experience.

The *secret-process* idea is exploded except in a few chemical industries where patents alone do not protect valuable formulas and processes. In the rock products industries there is no excuse for old secretive methods, and the men who practice them are likely to be as far behind their competitors as they think they are ahead. The man who closes his plant to all visitors seldom gets out himself to visit, nor does he seek enlightenment on improvements and modern methods through other available means, such as are afforded by the authoritative business journal of his industry.

Mr. Bixler has the right idea. He has gained a special knowledge of much value to him and his company; he gained it partly through the good will, generosity and broadmindedness of the typical American rock products producer. He recognizes his indebtedness to them—*to the industry as a whole*—by immediately giving them and the whole industry the benefit of his travels and observations, by allowing a full and complete description of his new plant to be published.

Mr. Bixler is no exception; he is no particularly shining example; he is the *type* of operator who makes all industry progress. Fortunately we have a great many like him. He makes possible a ***commerce in ideas and knowledge***. And that is the reason for the existence of ROCK PRODUCTS. It is a vehicle of that commerce; and we believe, in many cases, supplies the needs of the ordinary man for such travels as Mr. Bixler made.

Labor Shortage

Whatever may be our sentiments in regard to so-called Americanism of the kind that uses the formula "America for Americans," the facts are that the attempt of Congress to put such sentiments into law is seriously crippling American prosperity; and conditions are constantly growing worse. With the present law restricting immigration there is a dearth of common labor, more serious in the opinion of many operators than any other factor the construction and building-material industries have ever faced.

The editor recently sat in the office of a large quarry company in New York City and listened to the general manager answer plea after plea from contractors who were in need of crushed stone. And the only reason they could not get it was because the quarries are undermanned and it is absolutely impossible to man them at any price.

Transportation shortage is therefore not the only deterring force which prevents completion of construction projects and the starting of new ones. This particular company depends on the railways practically not at all.

Wages in this quarry are upwards of a dollar an hour for common labor. But these very wages defeat the object of increasing production for the only kind of labor which can be induced to work there is quite independent and is apt to work a half day instead of a whole day.

This country needs the kind of men who are willing to do an honest day's hard work, and Europe is teeming with men who want the chance. Unfortunately, our present immigration laws favor the "smart Aleck" type of immigrant who comes and gets by and goes on by his wits rather than by his brawn. We do not need his kind. We need a sober, industrious, thrifty laborer, and many of him; or some skilled mechanics and white-collared clerks are going to look for jobs soon.

At the coming conventions of the rock-products industries this matter of labor supply should be, and undoubtedly will be, fully discussed; and it is to be hoped that these industries will join with the Associated General Contractors of America and other associations interested in construction to prevent a real calamity, by inducing Congress to adopt a policy of *selective* immigration yes, but not *restrictive* immigration.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	.75	1.15	1.15	1.15	1.00	1.00
Prospect, N. Y.	.75	1.25	1.25	1.25	1.25	.....
Walford, Pa.	.....	1.30	1.30	1.30	1.30	1.30
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.50	.....	1.50	1.35	1.35	.....
Buffalo, Iowa	.90	.....	1.20	1.00	1.05	1.10
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	1.30
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.	.....	.....	.....	.....	1.75	.....
Greencastle, Ind.	1.00@1.25	1.10	1.00	.90	.90	.90
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Krause, Columbia and Valmeyer, Ill.	1.40	1.35	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	.....	.95	.85	.85	.85
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.80	1.35	1.05	.95	.90	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.45	1.40
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Southern Illinois	1.35	1.30	1.25	1.25	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Waukesha, Wis.			Prices include 90c freight all sizes .80 per ton			
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bromide, Okla.	.75	.....	.....	1.50	1.50	.....
Cartersville, Ga.	.....	2.00	2.00	1.40	1.40	1.40
Chickamauga, Tenn.	.75@1.00	.75@1.25	.....	.75@1.00	.75@1.00	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.60	1.25	1.40	1.35	1.20	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas) Tex.	1.00	1.40	1.35	1.30	1.25	1.20
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.05	.95	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	.90@1.00	2.00@2.25	1.75@2.00	1.40@1.50	1.30@1.40	1.50
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.15	1.50	1.45	1.35	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.10	2.10	2.00	1.75	1.60	1.60
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.50	1.60	1.40	1.30	1.30	.....
Columbia, S. C.—Granite	.....	.....	1.75@2.00	1.75	1.60@1.75	.....
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.30	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	1.00	2.00	2.00	1.35	1.35	.....
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	2.50@3.50	.....	2.00@2.25	2.00@2.50	.....	1.50
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. ‡Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk **2.50**

Grove City, Pa.—Analysis, 97% $CaCO_3$ —100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk..... 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$; 75% thru 100 mesh; bulk.... 4.50

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; 95% thru 50 mesh; bags, 4.00; bulk..... 2.50

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk **3.00**

Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk..... 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk.... 3.00

CENTRAL:

Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$—90% thru 100 mesh..... **6.00**
50% thru 50 mesh..... **4.00**

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh **1.50**

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk **2.50**

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh..... **1.25**

Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh..... 1.25

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$—50% thru 100 mesh 1.50
90% thru 4 mesh, cu. yd..... 1.35

Chasco, Ill.—Analysis 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh.... 5.00
90% thru 50 mesh..... 1.35

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... **1.00**

Columbia, Ill., near East St. Louis—⅛-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh **1.25**

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... **2.00**

Kansas City, Mo.—50% thru 100 mesh **1.50**

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.40

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... **2.00**

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; pulv. limestone; 60% thru 100 mesh; sacks..... 4.50
Bulk 3.00

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—33.6% thru 100 mesh, 40% thru 50 mesh..... 1.25@1.65

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$, pulverized limestone 1.50

Montrose, Ia.—90% thru 100 mesh..... 1.25

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O.—90% thru 100..... 3.25@5.00
40% thru 100..... 1.75@2.00
100% thru 4..... 1.25

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ⅛-in. mesh..... **1.30**

Stone City, Ia. —Analysis, 98% $CaCO_3$ 50% thru 50 mesh..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.00

Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk..... 4.25

Waukesha, Wis.—No. 1 kiln dried..... 2.00

No. 2 Natural..... 1.75

SOUTHERN:

Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh..... 2.75

Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh 2.00

90% thru 4 mesh..... 1.50

Cartersville, Ga.—Analysis, 54% $CaCO_3$, 41% $MgCO_3$—all passing 10 mesh..... 2.00

Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh..... 2.75

Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh..... 1.75

Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk..... 3.00

Knoxville, Tenn.—80% thru 200 mesh.. 3.50

80% thru 100 mesh..... 2.70

(Bags extra 1.25 per ton)

Ladds, Ga.—50% thru 50 mesh..... 2.00

Linnville Falls, N. C.—Analysis, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; 2.50 per ton bulk, 3.50 per ton mesh 200-lb. burlap; crushed limestone, 3/8 down, including dust, 1.00; 1 to 3/4, 1.60; 2-in. and less..... 1.40

Mountville, Va. — Analysis. 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 50% thru 20 mesh; sacks.. 5.00

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 2-4% $MgCO_3$—all thru 14 mesh—bulk 4.00

Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCo_3$; 50% thru 50 mesh ..... .50

Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80

Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. 2.25

Berkley Springs, W. Va.....2.00@ 2.25

Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25

Cheshire, Mass. .....5.00@10.00

Columbus, Ohio—Glass sand.....1.50@ 2.50

Dunbar, Pa. 2.25

Falls Creek, Pa. 2.50

Hancock, Md.—Damp, 1.50; dry..... 2.00

Klondike and Pacific, Mo.....2.00@ 2.50

Mapleton, Pa.—Damp, 2.00; dry..... 2.75

Massillon, Ohio 3.00

Michigan City, Ind.—Glass sand..... .50@ .55

Mineral Ridge, Ohio.....2.50@ 2.75

Green 2.00

Montoursville, Pa. 1.75

Oregon, Ill.—Glass sand.....1.25@ 1.75

Ottawa, Ill. 2.50

Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00

Rockwood, Mich. 2.50

Round Top, Md.—Damp, 1.50; dry..... 2.00

San Francisco, Cal.....3.00@ 3.50

St. Mary's, Pa. 2.25

Thayers, Pa. 2.00

Utica, Ill. .....1.25@ 1.50

Zanesville, Ohio .....2.00@ 2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 3.75

Molding fine and brass molding..... 2.00

Molding coarse 1.75

Allentown, Pa.—Core and molding fine 1.50@1.75

Arenzville, Ill.—Molding fine..... 1.40@1.60

Beach City, O. — Core, washed and screened ..... 2.00@2.50

Furnace lining ..... 2.50@3.00

Molding fine and coarse..... 2.25@2.50

Cheshire, Mass.—Furnace lining, molding, fine and coarse..... 5.00

Sand blast ..... 5.00@8.00

Stone sawing 6.00

Cleveland, O.—Molding coarse..... 1.50@2.00

Brass molding ..... 1.50@2.00

Molding fine ..... 1.50@2.25

Core ..... 1.25@1.50

Columbus, Ohio—Core ..... .30@2.00

Sand blast ..... 3.50@5.00

Furnace Lining 1.75

Molding fine 2.00

Molding coarse ..... 1.50@2.00

Stone sawing ..... 1.50@2.00

Traction ..... .90

Brass molding ..... 2.00@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.65	.90		1.00	
Farmingdale, N. J.	.48	.48	.75	1.20	1.20	
Haverstraw, N. Y.	.40		1.25	1.25	1.25	1.25
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.15	.70	.70	.70
Portland, Maine		50	1.75		1.35	1.35
Washington, D. C. (rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40				.90
Barton, Wis.		.60		.70	.70	
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.25	1.75@2.45			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75
Des Moines, Iowa	.60	.60	1.70	1.70	1.70	1.70
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.45	.45	1.25	1.00		.90
Elkhart Lake, Wis.	.50	.40	.60	.50	.50	.50
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.		.40		.60	.60	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Libertyville, Ill.		.50		.70		
Mankato, Minn.—Pit run	.50	.40	.40		1.25	
Mason City, Ia.	.75	.65	1.80	1.80	1.70	1.65
Mendota, Ill.	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.60@ .90	.60@ .90	1.20@1.50	1.20@1.50	1.20@1.50	1.20@1.50
Riton, Wis.		.60			.80	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.40
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.00	1.00
Waukesha, Wis.	.50	All other sizes, .70 per ton				
Winona, Minn.	.40	.40	1.25	1.00	1.00	1.00
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@ .70		.60@ .80	.50@ .70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala	1.48	all gravel—1.88				
Charleston, W. Va.		1.40	1.50			
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.	2.00@2.25	2.00@2.25	2.00	2.00	2.00	2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75	.75	1.25	1.25	1.25	1.00
Lake Weir, Fla.		60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.00	1.00	1.20			.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.	.50			1.00		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		.70		1.25		1.10
Pueblo, Colo.	1.10*	.90*			1.50	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.15@1.45
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	.85*	.85*	1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Tex.	.85@1.00					.55
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Tex.		.80		1.50		1.30
Winona, Minn.			Clean pit run .60			
York, Pa.		.95@1.10	(crushed rock sand)			

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.15
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.			1.35	1.35		1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05	1.45	1.75	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
		(Any delivery in city except team track deliveries)					
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

					Ground Burnt Lime		Lump Lime	
EASTERN	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Blk.	Bags	Blk.	Bbl.
Adams, Mass.			7.00				2.90	
Bellefontaine, Pa.			8.00	9.00	8.00		8.50	
Berkley, R. I.			12.00					2.30
Buffalo, N. Y.	10.50	9.00	8.50@11.00	12.00	8.00	10.00	8.00	1.50
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00	7.50	13.50			10.00	
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	10.50	11.50			7.50	1.65*
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio	10.50	9.00	8.50		7.25	9.25	8.00	
Delaware, Ohio	10.50	9.50	8.50	10.00			8.50	1.60
Gibsonburg, Ohio	11.50	10.00	10.00		8.00	10.00	9.00	
Huntington, Ind.	11.50	9.00	8.50				8.00	1.70*
Luckey, Ohio	11.50	10.00	8.00					
Marblehead, Ohio	10.50	10.00	10.00				9.00	1.60
Marion, Ohio		10.00	10.00					
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	11.50	9.00	8.50	11.00	7.25	9.25	8.00	1.50
Woodville, O. (dlrs.' price)	10.50a	10.50a	8.00a	10.50a	7.25		8.00	1.60
SOUTHERN:								
Erin, Tenn.							6.00	1.00
Karo, Va.							7.00	1.30
Knoxville, Tenn.	11.50@18.00	11.00	11.00	11.00	10.00	11.00	8.50	1.50
Ocala and Zuber, Fla.	12.00	11.50	11.50	14.00			12.00	1.60
Sherwood, Tenn.	12.00	11.00					8.50	1.50
Staunton, Va.					7.00	8.00	7.50b	1.40
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.							15.00	
San Francisco, Calif.	22.00	22.00	15.00	22.00			16.00	2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine 2.00
Molding coarse 1.90
Brass molding 2.15

Dresden, O.—Core and traction 1.00
Molding, fine and coarse 1.25
Brass molding 1.50

Dunbar, Pa.—Traction, damp 2.25

Dundee, O.—Glass, core, sand blast, traction 2.50
Molding fine, brass molding (plus 75c for winter loading) 2.00
Molding coarse (plus 75c for winter loading) 1.75

Eau Claire, Wis.—Core 1.00@1.25
Sand blast 3.25@3.75

Falls Creek, Pa.—Molding, fine and coarse 1.75
Sand blast 2.00
Traction 1.75

Franklin, Pa.—Core 1.25@1.75
Furnace lining 2.50
Molding fine 2.00
Molding coarse 1.75
Brass molding 2.00

Greenville, Ill.—Molding coarse 1.30@1.50

Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay (.60@ .80 only) .70

Kansas City, Mo.—Missouri River core .80

Kasota, Minn.—Stone sawing 1.30@1.50

Klondike, Pacific, Gray Summit, Mo.—Glass sand, furnace lining, molding coarse 2.00@2.50
Molding fine 2.00

Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry 2.75

Massillon, O. — Traction, molding fine and coarse, furnace lining, core 2.75

Michigan City, Ind.—Core, traction .40@ .45

Mineral Ridge, Ohio—(Green) core 2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding 2.00

Montoursville, Pa.—Core 1.25
Traction 1.00
Molding fine 1.50
Molding coarse 1.50@2.00

New Lexington, O.—Molding fine 2.00
Molding coarse 1.50

Oregon, Ill.—Core, furnace lining 1.25@1.75
Sand blast 3.00@3.50
Stone sawing 3.00@3.50
Traction 1.25

Ottawa, Ill.—Core, furnace lining, molding fine and coarse, traction, brass molding 2.50
Roofing sand 2.50@3.00
Sand blast 3.50
Stone sawing 3.00

Ottawa, Minn.—All crude silica sand .75@1.00

Pelzer, S. C.—Glass sand (carload lots

Rockwood, Mich.—Core, damp 1.90
Roofing 2.75
Sand blast 3.75

Miscellaneous Sands

(Continued)

Round Top, Md.—Glass sand 1.75@2.00
Core, furnace lining 1.45
Traction 1.60

(All per 2000 lbs.)

San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding 3.00@3.50
Direct from pit.
Furnace lining, molding coarse, sand blast 3.60
Stone sawing, traction 2.30

Thayers, Pa.—Core 1.75@2.00
Furnace lining 1.25
Molding fine and coarse 1.25
Traction 2.00

Utica, Ill.—Core 1.00
Furnace lining 1.25@1.50
Molding fine .90
Molding coarse 1.00
Stone sawing 1.25

Utica, Pa.—Core 1.75@2.25
Molding fine and coarse, traction, brass molding 2.00

Warwick, O. — Core, furnace lining, molding fine and coarse (damp, 1.75) dry 2.25
Traction, brass molding (dry) 2.00

Zanesville, Ohio — Brass molding and molding fine 1.50@1.75
Molding coarse 1.25@1.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags 10.00
Ground talc (150-200 mesh), bags 14.00
Cubes 50.00
Blanks (per lb.) .07

Chatsworth, Ga., and Marshall, N. C.—Crude talc 4.00@ 4.50
Ground talc (20-50 mesh), bulk 6.50, bags 7.50
Ground talc (150-200 mesh), bulk 7.50@9.50, bags 8.50@12.50

Chester, Vt.—Crude talc 5.50
Ground talc (150-200 mesh), bulk 7.00@ 9.00
bags 8.00@10.00

Emeryville, N. Y.—200-325 mesh; bags 14.00@16.00

Glendale, Calif.—Ground talc (150-200-mesh) 16.00@30.00
(Bags extra)
Ground talc (50-300 mesh) 13.50@15.50
200 mesh 13.50@14.50

Hailesboro, N. Y.—Ground talc (150-250 mesh), bags 18.00

Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton 2.75@ 3.50
Ground talc (20-50 mesh) 6.50@ 7.75
(150-200 mesh) bags 8.75@13.50

Johnson, Vt. — Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh) 8.00@15.00
(Bags extra)
Ground talc (150-200 mesh), bulk 10.00@15.00
(Bags extra)

Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags) 16.00@20.00

Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.50, bags 5.50
(150-200 mesh); bulk 6.50, bags 7.50

Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags 12.00@13.00

Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk 8.50@10.00
(Bags extra)
Ground talc (150-200 mesh), bulk 10.00@22.00
(Bags extra)

Vermont—Ground talc (20-50 mesh); bags 7.50@10.00
Ground talc (150-200 mesh); bags 8.50@15.00

Waterbury, Vt. — Ground talc (20-50 mesh), bulk 7.50
(Bags 1.00 extra)

Ground talc (150-200 mesh), bulk 9.00@14.00
(Bags 1.00 extra)

Pencils and steel workers' crayons, per gross 1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75% 6.00@8.50
B.P.L. 65% 6.00

Gordonsburg, Tenn.—B.P.L. 65%-70% 4.00@5.50

Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L. 7.00

Mt. Pleasant, Tenn. — Analysis, .70 B.P.L. (2000 lbs.) 6.50

Montpelier, Idaho—70% B.P.L.—Crude 4.75
Crushed 2-in. ring and dried 5.00

Paris, Idaho.—2,000 lb. mine run, B.P.L. 70% 4.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x 7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50.

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 70%	5.00@6.50

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	10.00@14.00
Slate granules		7.00@8.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	6.00@14.00	10.00@25.00
Lincoln, Neb. — Red, white, gray, in bags		30.00
granite; sacks	28.50@30.00	20.00@22.50
Marble chips, white, pink, creole, black		27.50
green		37.50
sparklets (bags extra)		50.00
Milwaukee, Wis.		20.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	16.00@20.00	14.00@18.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	12.00	
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 10c extra	5.00	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00@35.00
Birmingham, Ala.	15.00	30.00@40.00
Carpenterville, N. J.	20.00	36.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	20.00	33.00
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	20.00	30.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
Rochester, N. Y.	21.00	
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	22.00	35.00@80.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	14.00@15.00	33.00@75.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	10.00
Boston, Mass.	14.00@15.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	13.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	13.25
Michigan City, Ind.	11.00
Milwaukee, Wis.	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.00
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
f.o.b. cars	14.00
Washington, D. C.	14.50
Winnipeg, Can.	17.00@25.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75
Sheboygan, Wis.	.....	10.00

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Iowa	2.45
Cincinnati, Ohio	2.51
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Tex.	2.25
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.47
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.06
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.80
New York, N. Y. (includes bags)	2.40
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.24
Portland, Ore.	3.00
St. Louis, Mo.	2.35
San Francisco, Calif.	2.63
St. Paul, Minn.	2.39
Toledo, Ohio	2.47
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	——Plaster Board—— ⅜x32x36" Weight 1500 lb. Per M Sq. Ft.	⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	6.00	13.00	.....	12.00	.....	.....	.....	14.00	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	6.00	8.00	10.00	.....	.....	.....	31.25	21.00	19.38	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

New Machinery and Equipment

A Machine that Removes Dirt and Dust from Equipment

DUST and dirt accumulations on rock products equipment have been responsible for many unwholesome operating conditions, inefficient operations and rapid depreciation.

A practical machine for the removal of this trouble, with none of the disadvantages of other methods, has recently been offered to the rock products industry by the Electric Vacuum Cleaner Co., Cleveland, Ohio, in the form of a convenient portable machine operating as a suction or blowing device. It is the Premier Handy.

The cleaner in use as a blower

This machine consists of a small electric vacuum cleaner weighing but 6 lb. that is carried by a shoulder strap, allowing the use of both hands in directing the cleaning tools and which can be plugged in to any electric terminal. It is driven by a powerful air-cooled G. E. Universal motor operating on either alternating or direct current.

The machine may be operated either as a blower or a suction cleaner. When used as the latter all the dust and dirt are carried to a twill bag which can be emptied at will. As a blower, the bag is removed and a blower coupling is attached instead of a bag and the hose attached to the machine by this coupling.

It is equipped with a 2½-ft. hose sufficiently flexible to allow the free use of the tools, but not so flexible as to make careful guiding impossible. A hard rubber extension tube is provided to attach the cleaning tool to the hose. A soft rubber, narrow-mouthed tool that cannot scratch or be broken is also provided.

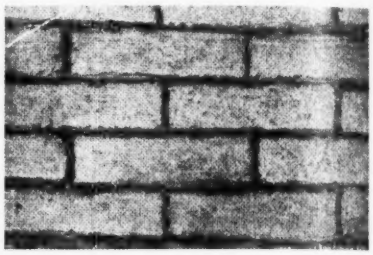
Besides being used for cleaning the entire electrical equipment of a plant, including generators, motors, controllers, switches, switchboards and power house equipment, says the manufacturer, it has an almost unlimited use around a plant for cleaning purposes. Particularly is this true in lime, cement, gypsum and like plants, where materials are very finely ground and dust accumulates extensively over everything.

Here it is applied as a suction cleaner

High Temperature Cement for Firebrick Linings

THE attention of cement, lime and gypsum producers and other users of firebrick is called to Wahl's high temperature cement, manufactured by the Wahl Refractory Products Co., Freemont, Ohio, a refractory material used for laying, coating and patching firebrick in cement and lime kilns, both vertical and rotary, gypsum kettles, and in fireboxes, arches and baffles of steam power plants.

This cement, claims the company, will not fuse under 3350 deg. F. It keeps a firm, air-tight joint between the brick, preventing the hot gases from attacking the brick on five sides instead of one, and is said to double the life of the brick over that of fire clay; does not weaken before maximum temperatures are reached, and will stand compression with cracking and falling away at the joints, particularly when temperatures drop and the brick contract; the edges are armored against the abrasion found in rotary kilns.



Protecting the edge of the brick against the flame with high-temperature cement

This powdered cement is packed in 100-lb. sacks. When used for laying firebrick it is mixed with water to the consistency of mortar and the brick coated with it so that when laid up and pressed together, some cement will ooze and extend a little above and below the joint. A thin cement solution is also used to paint the face of the lining; this prevents the hot gases from getting into the firebrick pores by protecting it with a vitrified coat.

Solid linings can be constructed by pouring a mix of this cement and water to the consistency of molding sand, into the space between a well-oiled form of wood or metal and the wall of the kiln or furnace.

New Single-Roll Crusher

THIS is a description of a new single-roll crusher put out by the Pennsylvania Crusher Co., Philadelphia, developed for preparing coal at industrial power plants, gas producer departments and in connection with pulverized fuel plants.

The frame of the original single-roll crusher made at Hollidaysburg, Pa., followed somewhat the line of double-roll practice, the side frames being set on heavy timber foundations, without metal

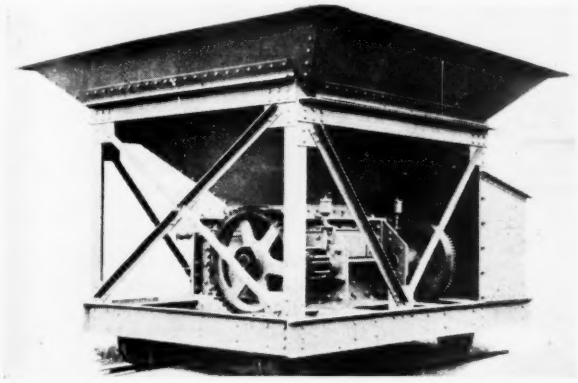
cross members, aside from the shafts. Later development provided heavy cast-iron side frames and cross members. The direct drive of the roll shaft by means of a large flywheel pulley soon gave place to the powerful back-geared drive through countershaft and smaller pulley. For heavy duty the frame was made in one massive box section casting, which later was sectionalized, particularly in the larger sizes.

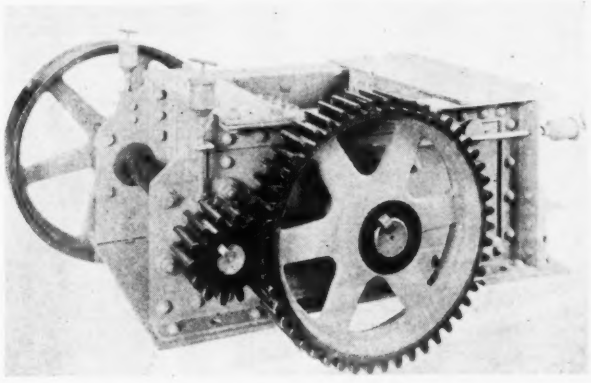
The latest fundamental improvement in single-roll design provides a frame fabricated from slab steel plates into an unbreakable unit. In the 18x18-in. and the 18x24-in. sizes, in which this design is now available, the steel side plates are 1 in. thick and are connected by nine steel cross members, all heavily hot riveted into this rigid box frame. Bronze bushed bearings are shouldered into the heavy side plates so that the bearing bolts are not subjected to shear.

The heavy flywheel pulley which drives the roll through heavy cut back gearing is provided with a shear pin safety device, mounting a steel bolt in hardened bushings, thereby insuring full protection of the crusher parts against the accidental introduction of tramp iron with coal. The breaker plate is a massive casting of high-grade charcoal iron deeply chilled on the crushing surface. It is hinged in the frame at the upper end and suspended at the lower end by means of powerful relief springs. The breaker plate tip, which takes most of the wear, is a reversible and renewable manganese steel casting. The segmental roll is cast from high-grade charcoal iron, deeply chilled, or from chrome steel.

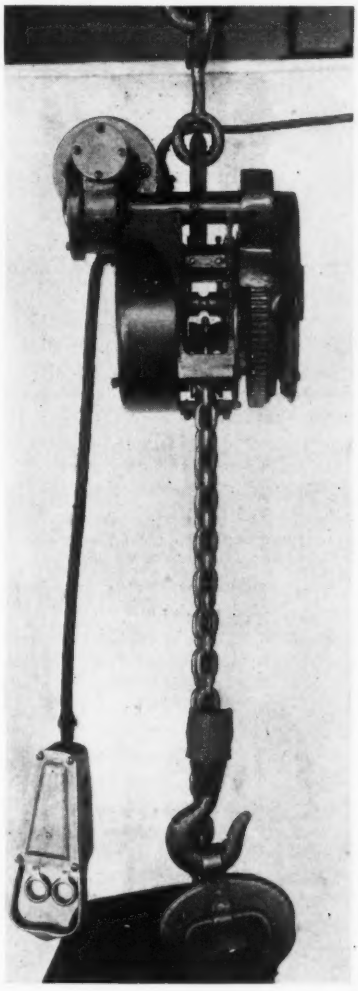
Convenient provision for adequate lubrication has been made by means of large steamboat type grease cups which can be screwed down without coming into close proximity with the moving parts.

The crusher proportions are liberal throughout, and the design insures a continuous supply of uniformly crushed coal by affording the three safeguards—unbreakable steel frame, steel shear pin safety device, and powerful relief springs—as protection against the heavy tramp iron encountered in r.o.m. bituminous coal which often has proven destructive to crushing machinery.





At the left is shown a new type of single-roll crusher for preparing coal. On the right the details of the crusher are shown



Standardized steel chain hoist equipped with a heavy-duty motor

A New Motor-Driven Chain Hoist

AN electrically operated material-handling device, known as the Motorbloc, has been placed on the market by the Motorbloc Corp. of Summerdale, Philadelphia, Pa. This new device has been developed to serve the operations lying between the well-defined field of the standard hand-chain hoist and that of the traveling electric hoist, with the substantial overhead and electrical installation which its heavy duty requires.

The Motorbloc is a rugged, readily portable hoist which can be installed without engineering preliminaries in any location where electric current is available. It is put in service with the facility of an electric drill, and the self-contained pendant controller permits convenient operation as soon as the cord has been plugged into the nearest electric circuit. In its design, care has been used in avoiding the stressing of the hoisting mechanism beyond the loads and speeds for which it is proportioned for hand operation. While removing the labor from the hoisting operation, the electrification reduces the wear on some of the vital parts.

The Motorbloc consists of a standardized steel chain hoist electrified by a specially designed heavy-duty motor, liberally proportioned reduction gearing and slip friction clutch, applied by means of a malleable iron supporting bracket comprising a self-contained electrifying unit, to which the pendant controller is also attached. Thus—simple, rugged mechanism has been developed for the electrification of the standard spur-geared chain hoist in capacities ranging from ¼ to 10 tons, proportioned to stand up under the severe overloads and abuse to which such portable apparatus is subjected by common labor.

It has compactness, symmetry and balance, combined with lightness and strength through the use of high-grade materials,

proportioned to meet severe service conditions. The armature shaft and worm are carried in heavy-duty ball bearings and liberal provision has been made for adequate, automatic lubrication. The self-contained, pendant controller is operated by the fingers of one hand, leaving the other free to guide the load, thus making it possible for one man to accomplish what would otherwise require two or more for lifting and placing the same load. The one-ton size complete weighs only 148 lb.

Simplicity is promoted and the operation safeguarded by the use of the ring-oiled slip friction clutch which prevents damage from overrunning to the hoist parts and chain and at the same time completely protects the motor from overload, without the complication of an electric limit switch. The accompanying illustration shows the Motorbloc built on a Franklin-Moore all-steel suspension spur-geared chain hoist.

For occasional use at points where electric current is not available, or in the event of the temporary failure of electric power, the hand chain can be quickly applied, and the hoist operated as an ordinary block. While regularly furnished as a complete hoisting device, the self-contained electrifying unit can be readily applied to standard chain hoists already in service.

Gypsum's Many Uses

HERE are some interesting facts concerning gypsum which were recently sent out by the Chicago office of the Gypsum Industries Association. This is good publicity. It sets a good example for other associations which desire to aid their producers to market their wares:

The United States Geological Survey's publication, "Gypsum in 1921," draws attention to the fact that during 1921 there was used more than 3,000,000 tons of this material. This interesting information naturally raises the question, "What is gypsum, and for what purposes is it used?"

Gypsum is a rock mined or quarried in 18 of our states, and it is also imported from Alaska and Canada. This mineral and its products are not expensive, although materials made from gypsum enter into the construction of every class of building. In fact, without gypsum, our present modern structures, from the largest bridge to the smallest bungalow, could not be built.

Portland cement, which is used for concrete, foundation work, mortar, etc., uses gypsum in the processes of manufacture. All plastered walls are smoothed off with a finish coat in which gypsum is the most important ingredient. The imitation tile finish placed upon the walls of bathrooms and lavatories wainscoat high is Keene's cement, which is a product of gypsum.

The most permanent and lasting walls in the interiors of buildings are plastered with gypsum plasters. Again, gypsum wall boards are used in the place of lath and plaster in cases where a plastered wall or ceiling cannot be considered or is not desired. This character of wall and ceiling finish will not burn, warp or buckle. To meet the increasing demands for more fireproof types of construction a lath which will not burn is made of gypsum and is marketed to builders under the name of "Gypsum plaster board."

Fireproof buildings throughout the United States, Canada and in Europe use quantities of gypsum for fireproofing. In such structures the gypsum, poured-in-place or in the form of tile, is used for fireproofing the steel columns, trusses and similar supports and also for fireproof partitions, floors and roofs. Of the materials used in fireproof construction and for fire protection purposes, gypsum is the best non-conductor of heat and cold and its total amount of expansion, when subjected to high temperature, is so little that with ordinary instruments it cannot be measured.

Big Gypsum Shipments from San Diego

SAN DIEGO'S big gypsum plant has fulfilled the expectations of its backers and joined the host of enterprises which owe success to persevering effort in the face of countless obstacles, says the San Diego *Union*.

Victory for the gypsum plant on the line of the San Diego & Arizona Railway came recently when quantity shipments began to leave the mine. More than 1000 tons of gypsum already have been delivered to the calcinating plant at Los Angeles and shipments are going forward at the rate of 300 tons a day.

The gypsum now is dug out by gas shovels, loaded on dump cars and hauled to the crushing plant situated at the junction of the San Diego & Arizona and the narrow gage line. The material is crushed and delivered direct into standard cars.

At present the calcining plant at Los Angeles is handling the output, but arrangements are being made to increase the capacity of the Coyote Wells mine and send out shipments aggregating more than 1000 tons daily.

Before the first shipment of magnitude could be made, more than $200,000 was expended for rail and plant facilities. It is planned to install a calcining plant at the junction and ship the finished product through the port of San Diego to the coast market.

Will This Movement Stop Car Shortages?

WHAT promises to be a national movement to stop if possible "the yearly hogging of open cars by the coal industry," as the leaders of the movement describe it, has been started in Illinois.

At a meeting of those interested held in Springfield, Ill., on October 12, an association was formed and named the Illinois Construction and Transportation Association. Fred Murphy, secretary of the Brownell Improvement Co., was elected president and chairman of the Association, and the other officers elected were: First vice-president, D. H. Jansen, of Jansen and Schaeffer, contractors; second vice-president, T. E. McGrath, president, McGrath Sand and Gravel Co.; treasurer, L. S. Trainor, district engineer, Portland Cement Association; and secretary, C. E. Mateer, secretary, Illinois Municipal Association.

At this first meeting there were representatives from practically all of the sand and gravel, cement, brick, asphalt, crushed stone, equipment, contracting and other interests connected with the road-building industry. The following committee was appointed to represent these industries and to act in conjunction with the officers of the association as an executive committee: E. S. Gubernator, cement; Stewart Gardner, stone; M. D. Schaff, sand and gravel; E. L. Middleton, paving brick; J. E. Schniedwind, equipment; George Reiter, Illinois Society of Engineers; W. F. Lodge, contractors; John Hittle, asphalt; L. Lindquist, bankers; John McKechney, bonding companies; Ralph M. Field, Chamber of Commerce, Peoria, Ill.

A second meeting was held in Springfield on October 30, with an attendance of approximately 250. At this meeting it was decided to hold a third meeting on the dates of the national convention of the American Road Builders Association and the Good Roads Show, January 15 to 19, in Chicago. Until that time the officers and executive committee will make efforts to extend the operations of the association to all the other states in the Union with the idea of creating a body which can go before the Interstate Commerce Commission with national representation to protect the interests of those connected with the association. It is hoped to prevent a repetition of the car shortages which have brought financial loss and in some cases ruin to those in road building or the production of road materials.

Colonel Miller, director of public works, and Frank Sheets, superintendent of highways, both of the state of Illinois, have agreed to go to Washington with the association in their official capacity and lend their aid to this movement so that the priorities of 1920 and 1922 will not be repeated in the future.

News of All the Industry

Incorporations

The Two States Lime Co., Wilmington, Del., has been incorporated for $1,500,000.

The Alabama Rock Asphalt Co., Dover, Ala., has been incorporated for $1,000,000.

The American Rock Asphalt Co., Pittsburgh, Pa., has been incorporated for $3,000,000.

The Detroit Graphite Co., Houston, Tex., has been incorporated by L. R. Wyles, O. N. Edgar and A. D. Dyess.

The Acme Limestone Co., Kansas City, Mo., has been incorporated for $300,000 by W. G. Dilts, L. J. Morgan and W. W. Young.

The Turner Gravel Co., San Antonio, Tex., has been incorporated for $50,000 by A. P. Turner, L. Hetlage and J. Aiken.

The Norton Stone and Lime Corp., Cobleskill, N. Y., has been incorporated for $500,0000, by A. L. and F. P. Norton and H. F. Head.

The Michigan Moulding Sand Co., Port Huron, Mich., has been incorporated for $9000 by W. B. Sickler, W. D. Thompson and W. F. Miller.

The Trenton Stone Co., Utica, N. Y., has been incorporated for $100,000. Directors are Michael Moore, Utica; Guy A. Underhill and Arthur B. Rider, Syracuse.

The Phoenix Stone Co., Manhattan, N. Y., has been incorporated for $50,000, and will quarry soapstone. Incorporators are T. F. Conlon, R. W. Owens, Jr., and J. J. McGinty.

The Indiana Oolitic Limestone Co., Indianapolis, Ind., has been incorporated for $1,000,000 by J. R. Gum, E. Lowden, J. M. Wampler, R. L. McNair, C. E. Mallery, W. S. Johnson and F. Johnson.

The Todd Process Stone Co., Point Pleasant, N. J., has been incorporated for $50,000 by G. L. Shinn, president; J. B. Hutchinson, secretary, Trenton; R. A. Hatfield, treasurer, and W. A. Todd, superintendent, Point Pleasant.

The Roseland Concrete Products Co., 12110 South Michigan avenue, Chicago, has been incorporated for $10,000 to manufacture and deal in concrete products, by W. C. Jones, E. M. Peterson and Edith M. Jones.

Sand and Gravel

The Crystal Lake Ice Co., Crystal Lake, Ill., have purchased 40 acres of land and will open a gravel pit on this tract of land.

The Monroe Sand and Gravel Co. has been organized in Monroe, La., by T. E. Stephenson and others, to develop sand and gravel deposits.

The Automatic Gravel Products Co.'s machine plant, Muscatine, Ia., was totally destroyed by fire believed to have been caused by defective wiring, it is estimated at a total loss of $15,000. A new plant will be constructed at once to replace the old one.

Quarries

Robert Lutz, Oshkosh, Wis., is letting contracts for the erection of a crushed stone plant.

The Blue Mountain Stone Co., Hagerstown, Md., has increased its capital stock to $500,000.

The Ohio Quarries Co., Amherst, O., announces a wage increase for all employes of five cents per hour.

The Rampus Stone Co., Strawberry Plains, Tenn., has been taken over by the Holston Quarry Co., Knoxville, Tenn.

Burnet, Tex.—The Southwestern Graphite Co.'s mine is again operating and the graphite supply is believed to be well-nigh inexhaustible.

The McGelvary-Raymond Granite Co., Lakeside, Calif., is shipping gray granite at the rate of a carload a week. The granite is of exceptional quality and weighs 190 lb. per cu. ft. Operations began 10 years ago and the company contemplates many improvements within the next year. Saws for shaping blocks will also be installed. The deposit purchased 10 years ago for $2500, now with machinery that has been installed, represents an investment of probably from $75,000 to $100,000.

Cement

The Three Forks Portland Cement Co.'s plant, Hanover, Mont., is now operating three shifts and is making heavy shipments of its products, both portland cement and gypsum.

The San Antonio Portland Cement Co., San Antonio, Tex., has been awarded the contract to furnish 10,000 bbl. of cement for road work, at $2.70 per bbl., by the city of San Antonio.

The Oklahoma Portland Cement Co., Ada, Okla., plans to install a complete railway system from Ada to its rock quarries at Lawrence as soon as possible, is announced by its president, Charles Boettcher. The Lawrence quarry is one of the largest in the state. The company recently completed a new plant which uses the "wet" process. A power plant sufficient to furnish electricity to run the plant in Ada and its plants at Lawrence is also being built.

Lime

The Keystone Lime Works, Inc., Keystone, Ala., has recently installed a No. 3 hydrator in its lime plant in that city.

Carthage, Mo.—Charles Shull and H. T. Oltman have leased the lime kiln property at Sarcoxie, and are proceeding with plans to erect a crushing plant to manufacture fertilizer.

The Limestone Products Corporation of America will remove its offices from Park Block Bldg. to Newton Trust Company Bldg., Newton, N. J., and will be located here November 1.

The Beaver Portland Cement Co., Portland, Ore., is planning on extensive development work and have called for bids for the construction of three miles of standard gauge railroad and 6,000 ft. of tramway to connect with the C. & O. Coast Ry. It is also probable that a plant will be erected near Grant's Pass, upon the completion of the railroad. The whole enterprise will cost approximately $1,500,000.

John H. Adams, president of the O'Neill Lime Works, Inc., Birmingham, Ala., with A. A. Alles, Jr., of the Schaeffer Engineering & Mfg. Co., is on a tour of large lime works in Woodville and Toledo, O., Philadelphia, Bellefonte, Pittsburgh, Pa., and other places, and the machinery used in those plants, besides the nature of plant construction, will be thoroughly investigated. The plans are to erect a modern lime works at the quarries of the O'Neill Co. Work will be started this fall and approximately $350,000 will be expended in the development, including the railroad extension. Construction of the plant will have in mind the elimination of as much labor as possible. The output will be up to thousands of bbl. daily. The plant is expected to be in operation by next spring.

Concrete Products

The N. Q. Speer Sand Co., Goshen, Va., is installing machinery for the manufacture of cement blocks.

The Tex-McCracken Concrete Pipe Co. will build a $75,000 plant in El Paso, Texas. H. E. Johnson is manager.

The Biddle Concrete Co., Clarksburg, W. Va., has increased its capital stock to $150,000. C. C. Floyd is president.

The Bliss Waterproof Concrete Block Co. is having plans drawn for a factory to be built in Jamaica, L. I., N. Y.

The Formless Concrete Construction Co., White Bear, Minn., has been incorporated for $50,000 by E. Bernish and others.

The Limestone Brick Co., Boston, Mass., has been incorporated for $100,000 by R. J. Cram, Waban; A. N. Hunt and D. B. Hall, Braintree.

The McCracken Pipe Co., Sioux City, Iowa, is reported to erect a $25,000 sewer pipe factory in Cape Girardeau, Mo. J. W. McCracken is president.

The Arundel Shope Brick Co., Baltimore, Md., has been incorporated for $10,000 to manufacture concrete brick. Incorporators are R. A. Froehlinger, L. L. Wagner and W. C. Mylander.

The Lansing Cast Stone Co., Lansing, Mich., has increased its capital stock from $50,000 to $150,000. A new cement and brick making plant will be added to bring the cement block production up to 55,000 daily.

The Western Brick and Supply Co., Hastings, Nebr., will equip its east brickyard, recently destroyed by fire with up-to-date machinery and equipment. The normal capacity of the plant is 7,000,000 brick per year.

Phosphate Rock

Columbia, Tenn.—J. P. Greenlaw has purchased the property of the Rhum Phosphate Co., its grinding plant and several acres of phosphate property.

The Florida Phosphate Mining Co. will begin operations at its Royster Mine within the next few weeks. The company also plans to begin operating its Morris mine at full capacity as soon as the new machinery is installed.

Dealers

The Builders Supply Co. has changed its name to The Cumberland Cement and Supply Co., Liberty Trust Building, Cumberland, Md.

The Seminole Product Co. has been incorporated for $400,000 in Jacksonville, Fla., and will deal in lime, plaster, cement brick, stone, sand, gravel and other building material. L. R. Nordquist is president; J. D. Mills, vice-president; and H. W. Mills, secretary and treasurer.

Manufacturers

The Brown Instrument Co. has opened a New England branch office at 185 Devonshire street, Boston, Mass.

The Sandusky Cooperage and Lumber Co., Toledo, Ohio, has removed its offices to 3820 Washington Blvd., St. Louis, Mo.

Major J. Perry Moore, former executive assistant in charge of industrial relations for the Humble Oil and Refining Co., has resigned to become manager for the Texas Belting Co.

Swafford's Material Supply Co., Okmulgee, Okla., has been incorporated for $25,000 to handle building material. Incorporators are C. H. Swafford, W. A. Bowerman and J. H. Swafford.

H. W. Hardinge returned on October 3 from a three months' trip in Europe on the S.S. "Berengaria." His trip was for the purpose of studying mining and industrial conditions in Italy, Switzerland, France and England.

Personal

M. J. Johnson, formerly superintendent of the Henry Cowell Lime and Cement Co., Cowell, Calif., has accepted a position as superintendent with the Pacific Marble Quarries Co., Baxter, Calif.

Walter S. McKee has resigned as vice-president and director of the American Manganese Steel Co., and will develop the business of the Inland Engineering Co., Chicago, of which he is president.

J. B. Clark, Jr., has recently become associated with the Pennsylvania Crusher Co. as sales manager, and will have charge of the New York office, Hudson Terminal, 50 Church street, New York City. Since graduating from the engineering department of Penn State, Mr. Clark has had broad experience in plant erection and operation.

Frederick Stugard, formerly chief chemist and superintendent of the Kosmos Portland Cement Co., Louisville, Ky., has accepted a position with the National Cement Co., Birmingham, Ala., as chief chemist at its plant at Ragland, Ala. The same company also owns the Georgia Cement and Stone Co., Portland, Ga. Mr. Stugard was connected with the Kosmos Portland Cement Co. since the day it started production in 1905. He served in the various capacities of assistant chemist, chief chemist, assistant superintendent and superintendent during the course of his employment at its plant at Kosmosdale, Ky.

Trade Literature

Belts—The Link-Belt Co., Chicago, Philadelphia and Indianapolis, has issued a new general catalog No. 400, of 832 pages, cloth bound, which includes not only the complete Link-Belt line but also the products of the H. W. Caldwell & Son Co. plant.

Trucks and Cranes—A bulletin has been recently issued describing the "Truckrane" manufactured by the Byers Machine Co., Ravenna, O. This is an eight-page folder devoted to an illustrated description of this machine, its purpose, etc., and also gives examples of this machine in action on various construction and transportation jobs.

Conveyors—The Portable Machinery Co., Passaic, N. J., has recently put into a four-page folder illustrations and descriptions of its "New-Way" engine, which runs on either kerosene or gasoline. This machine handles coal, sand, coke, gravel, ash, stone, etc. Included are specifications and clearance dimensions and export information.

Crushing and Quarrying Machinery—This is a 36-page booklet issued by the Good Roads Machinery Co., Inc., Kennett Square, Pa., giving illustrations of rock crushers, elevators, screens, conveyors, portable stone bins, winding drums, dump cars, and rock drills, manufactured by the company. It also shows a wide range of sizes, machines for portable use as well as larger and heavier types for stationary plants. This company furnishes all the appliances required for installing complete crushing outfits.

U. S. G. "Red Book"—This is an 82-page book, this year's edition, describing the products manufactured by the U. S. Gypsum Co., Chicago, for the reference of architects, contractors, plasterers, and dealers. It has been prepared to enable the reader to obtain the maximum results from the use of gypsum products. The information given has been "compiled and condensed from data gathered through years of exhaustive study and research."

Splicing Wire Rope—John A. Roebling's Sons Co., Trenton, N. J., have prepared a catalog under the title of "The Splicing of Wire Rope" which is an illustrated description of the method of wire rope splicing employed in the shops of the company. Two types of splicers are shown. The first is that of the regular standard splice for all six-strand ropes. The second, the Chicago, or tied splice for ropes of eight strands. The illustrations are from photographs taken during the splicing of Standard Lay Hoisting Rope and of Extra Pliable Hoisting Rope.

Crane Excavators—Koehring Co., Milwaukee, has issued two bulletins in the form of four-page folders illustrating and giving specifications for its Nos. 2 and 3 crane excavators, which are operated by gasoline engines. They may be equipped with either clamshell or dragline buckets. The No. 2 machine has a capacity of 12 tons at a 12-ft. radius and is equipped with a 40-ft. boom. The No. 3 unit has a capacity of 20 tons at a 12-ft. radius and also is equipped with a 40-ft. boom. The gasoline-engine capacities are, respectively, 70 and 100 hp.

Plan 360,000 Miles of Roads

CONSTRUCTION OF 180,000 miles of improved road will be completed during the next 15 years by the federal government and an equal mileage of state and local roads, under the program of the federal aid highway system. This was the purpose of the second national conference on education for highway engineering and highway transport, held under the auspices of the Highway Education Board at its three-day meeting in Washington on October 26 to 28.

Dr. John J. Tigert, United States Commissioner of Education and chairman of the Education Board, presided.

Officials of the board estimated the cost of the government's share at $2,000,000, spread over the 15-year period. The average cost of these roads will be $17,000 a mile. One-third of the system is either built already or under construction.

The Bureau of Public Roads is engaged in research work into the most efficient methods, including the character and wearing power of materials and the existing quality of various substances. The meeting was well attended and the general hope was expressed that the results of the conference would be the means of promoting more and better highways.

Telephone Court 4508-4509

H. R. EICHER

608-609 Maloney Bldg. Pittsburgh, Penna.

We have purchased from the Consolidation Coal Co. and the Cumberland & Pennsylvania R. R. Co. all of their Surplus Equipment. In this lot we have listed below some of the items and equipment that might be of interest to you at a very low figure. This material is all in A-1 condition, mechanically and otherwise, and will be loaded f. o. b. Frostburg, Md., and can be inspected at that point. Detailed specification on any item obtainable at our Pittsburgh office.

1—Norwalk 3-stage Air Compressor, straight line with intercoolers; steam pressure 125 lb.; air pressure 900 lb.; capacity 750 cu. ft. at 85 R.P.M.
1—Ingersoll Duplex Cooper-Corliss, steam pressure 125 lb.; air pressure 900 lb.; capacity 1409 cu. ft. free air at 80 R.P.M.
1—Ingersoll Duplex Cooper-Corliss 3-stage with intercooler; steam pressure 125 lb.; air pressure 900 lb.; capacity 800 cu. ft. at 90 R.P.M.
1—Ingersoll-Sargeant straight line; steam pressure 125 lb.; air pressure 150 lb.; capacity 1442 cu. ft. at 80 R.P.M.
1—Ingersoll straight line; steam pressure 125 lb. air pressure 150 lb.; capacity 382 cu. ft. at 100 R.P.M.
1—Rand straight line, steam pressure 125 lb.; air pressure 150 lb.; capacity 380 cu. ft. free air per minute at 125 R.P.M.
2—Ingersoll-Rand Imperial Type 10, capacity 1319 cu. ft. per minute; piston displacement at 150 R.P.M.; complete with 1-KY General Electric 200 H.P. Motor 3-phase, 60 cycle, 220 volts; 600 R.P.M. with C. R. 1034-H3 Compensator base and pulley 24x32x5; also complete with Air Receivers, Gauges, Fittings, etc.
1—Ingersoll-Rand Class J-2 single acting 2-stage 24¼x14¼x 18 in.; capacity 1000 cu. ft.; maximum pressure 100 lb. at 135 R.P.M.; complete with 1-200 H.P. Westinghouse Motor 3-phase, 60 cycle, 220 volts with slide rails, pulley and starting device; also 1-55-ft. 21-in. 2-ply Endless Leather Belt; complete with Air Receivers, Gauges, Fittings, etc.
3—Air Receivers, 30-in. dia. x 20 ft. long, tested 1000 lb. pressure.
1—Air Receiver, 60 in. dia. x 12 ft. long, tested 150 lb. pressure.
1—Air Receiver, 30 in. dia. x 6 ft. long, tested 150 lb. pressure.
1—150 H.P. Butt strapped triple riveted H. R. T. Boiler, complete with stacks, fronts, fittings, buck-stays, etc.
2—125 H.P. H. R. T. Boilers, complete, same as above.
2—Westinghouse Standard Steam Engines, 7½x7 in., 350 R.P.M., 20 H.P.
1—Case Steam Engine, 8 H.P., pulley 18 in. x 6¼ face, flywheels 18x5½, 648 R.P.M.
1—110 K.W. Allis-Chalmers A.C. Generator, 2200 volts, 225 R.P.M. direct connected to Harrisburg steam engine 16x 14, 150 H.P., 225 R.P.M.
2—150 K.W. Westinghouse D.C. Generators, 250-275 volts, 550 R.P.M.
1—160 H.P. Buckeye Generator Engine, 18x18¾, pulley 90 in. x 26 in., 200 R.P.M.
1—Westinghouse stand. engine, 7½x7 in., 350 R.P.M., 125 lb. pressure direct connected to 15 K.W. Wood Generator, type MPL Compound wound, 350 R.P.M. 125 volts, complete with switchboard, instruments, main line switches, fuses, etc.
1—7x10 Single Drum double cylinder Mine Hoist; drum dia. 40 in., face 40 in.
1—Double Drum Haulage Hoisting Engine; drums set side by side; 10x12, 40 in. drum dia., 40 in. face, flange 4½ in; levers banked.
1—H. K. Porter Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
1—Baldwin Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
1—H. K. Porter Air Locomotive, 6 wheel, 15 ton, 36 in. gauge.
1—Baldwin Compound Locomotive, 10 ton, 36 in. gauge.
4—Baldwin Gathering Locomotives, 4 ton, 36 in. gauge.
1—Cameron special Plunger Pump.
1—No. 3 Cameron Plunger Pump.
3—No. 9 Cameron Plunger Pumps, all bronze ends.
1—Cameron Boiler Feed Pump, 300 H.P.
1—Boiler Feed Duplex Pump, 7x4x10.
2—MacGowan Pressure Pumps, 6x10-5 in. suction, 4 in. discharge.
1—8-ft. Cast Iron Sheave; 1 5-ft. C. I. Sheave; 1 42-in. Cast Iron Sheave.
1—Storage Oil Tank, 8 ft. diameter, 30 ft. long.
1—Lot Steel Shafting ranging from 2 in. to 10 in. in diameter.
1—Lot Forged and Nickeled Steel, including some case hardened material in lengths from 4 ft. to 20 ft.
1—Miscellaneous lot of Pipe, Pipe Fittings, High and Low Pressure Valves, etc.

Waste Heat CAN be Captured

A RECENT newspaper advertisement prepared by the Portland Cement Association says in part:

> "In a certain town of 12,000 inhabitants there is a 4-kiln plant where the heat lost through the stacks, because of the great temperature and draft required below, would, *if it could be captured,* supply three times the electric light and power used by all the rest of the town."

Fuel energy sufficient to supply the light and power needs of 36,000 persons lost—*wasted*—through the stacks of one cement plant!

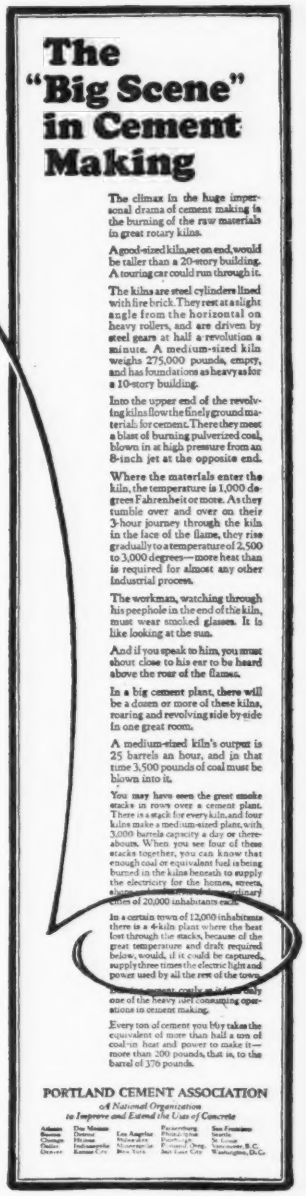
Yet a great part of that waste heat *could* be captured and put to useful work.

Cement mill operators who have appreciated the tremendous savings made possible by the utilization of waste heat have equipped their plants with the EDGE MOOR WASTE HEAT SYSTEM. These plants are obtaining, on the average, about 350 lbs. of steam or 20 kilowatt-hours from each 100 lbs. coal burned, at no added expense for fuel. The heat thus recovered is usually sufficient to generate all the steam and power required in the entire plant.

EDGE MOOR WASTE HEAT SYSTEMS are installed with a definite guarantee of results. Edge Moor engineers supervise the entire installation, and the purchaser assumes no risk.

Let us tell you how the EDGE MOOR WASTE HEAT SYSTEM can effect substantial economies in your plant. Your inquiry will place you under no obligation.

EDGE MOOR IRON COMPANY
Established 1868
EDGE MOOR, DELAWARE
New York Chicago Boston Charlotte St. Paul Pittsburgh



The "Big Scene" in Cement Making

The climax in the huge impersonal drama of cement making is the burning of the raw materials in great rotary kilns.

A good-sized kiln, set on end, would be taller than a 20-story building. A touring car could run through it.

The kilns are steel cylinders lined with fire brick. They rest at a slight angle from the horizontal on heavy rollers, and are driven by steel gears at half a revolution a minute. A medium-sized kiln weighs 275,000 pounds, empty, and has foundations as heavy as for a 10-story building.

Into the upper end of the revolving kilns flow the finely ground materials for cement. There they meet a blast of burning pulverized coal, blown in at high pressure from an 8-inch jet at the opposite end.

Where the materials enter the kiln, the temperature is 1,000 degrees Fahrenheit or more. As they tumble over and over on their 3-hour journey through the kiln in the face of the flame, they rise gradually to a temperature of 2,500 to 3,000 degrees—more heat than is required for almost any other industrial process.

The workman, watching through his peephole in the end of the kiln, must wear smoked glasses. It is like looking at the sun.

And if you speak to him, you must shout close to his ear to be heard above the roar of the flames.

In a big cement plant, there will be a dozen or more of these kilns, roaring and revolving side by side in one great room.

A medium-sized kiln's output is 25 barrels an hour, and in that time 3,500 pounds of coal must be blown into it.

You may have seen the great smoke stacks in rows over a cement plant. There is a stack for every kiln, and four kilns make a medium-sized plant, with 3,000 barrels capacity a day or thereabouts. When you see four of these stacks together, you can know that enough coal or equivalent fuel is being burned in the kilns beneath to supply the electricity for the homes, streets, [illegible] cities of 20,000 inhabitants each.

In a certain town of 12,000 inhabitants there is a 4-kiln plant where the heat lost through the stacks, because of the great temperature and draft required below, would, if it could be captured, supply three times the electric light and power used by all the rest of the town.

[illegible] one of the heavy fuel consuming operations in cement making.

Every ton of cement you buy takes the equivalent of more than half a ton of coal in heat and power to make it—more than 200 pounds, that is, to the barrel of 376 pounds.

PORTLAND CEMENT ASSOCIATION
a National Organization to Improve and Extend the Uses of Concrete

EDGE MOOR Water Tube BOILERS

FOR INCREASED FUEL ECONOMY

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Bury Compressor Co., Erie, Pa.

AUTOMATIC WEIGHERS
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
[illegible]ite Co., The, Jaite, Ohio.

BINS
Austin Mfg. Co., Chicago, Ill.
Bland Engineering Co., Minneapolis, Minn. (storage).
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill. (storage).

BIN GATES
Allis-Calmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Du Pont de Nemours & Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

BOILERS, WASTE HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BUCKETS—Elevator
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS, GRAB
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Flory Mfg. Co., S., Bangor, Pa.
Interstate Equip Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Construction Co., Easton, Pa.
Ottumwa Iron Works, Ottumwa, Iowa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CLUTCHES
Webster Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Locomotive Gantry
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Jeffrey Mfg. Co., Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CLUTCHES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.
Mundy Hoisting Engine Co., J. S., Newark, N. J.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGING MACHINERY
Flory Mfg. Co., S., Bangor, Pa.

DRILLS
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Du Pont de Nemours & Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Hunt, R. W., & Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.

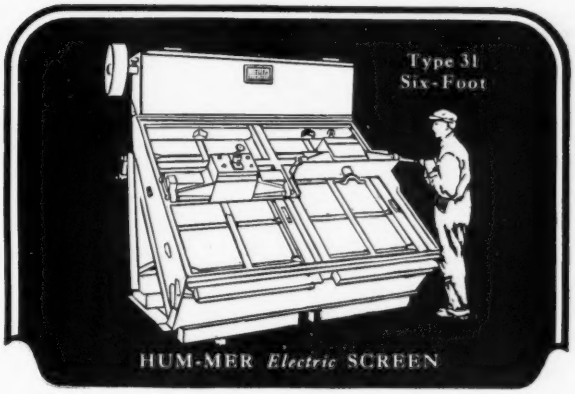
EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Du Pont de Nemours & Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Cleveland Worm & Gear Co. Cleveland Ohio.
Link-Belt Co., Chicago, Ill.

(Continued on page 60)



"A WONDER SCREEN"

Woodville Lime Products Co.

HUM-MER users naturally and spontaneously become enthusiastic when they observe the increased tonnage, the improved separation, and the greater profit, obtained with the HUM-MER Process of Screening.

At the plant of the Woodville Lime Products Co., a three-foot HUM-MER is handling as much as 80 tons per hour of limestone, making a separation at ¼ inch mesh, and this machine has only half the capacity of the six-foot machine illustrated above.

This company is so well pleased with the high tonnage and low maintenance of the HUM-MER that they term it a "wonder screen."

The "live", taut screening surface of the HUM-MER, the intense electric vibration adjustable to the particular material, the mechanical simplicity, all combine to produce a clean, sharp separation and continuous, large tonnage production.

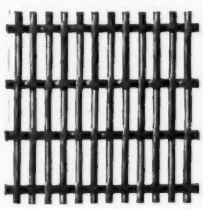
Materials ranging from 2½ inch diameter to minus 200 mesh are being profitably separated by the HUM-MER.

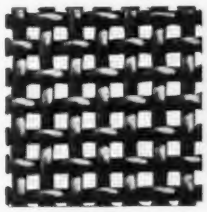
Write us about your material and requirements, and we will submit a proposition showing how you can profit by using the HUM-MER Process.

Request Catalog 42-R

THE W. S. TYLER COMPANY, *Cleveland, Ohio*

Manufacturers of **Woven Wire Screens and Screening Equipment**





Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

(Continued from page 58)

GENERATORS
Burke Electric Co., Erie, Pa.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Austin Mfg. Co., Chicago, Ill.
Flory Mfg. Co., S., Bangor, Pa.
Link-Belt Co., Chicago, Ill.
Ottumwa Iron Works, Ottumwa, Iowa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Blaw-Knox Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Jeffrey Mfg. Co., Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MANGANESE STEEL
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

MOTOR TRUCKS
Traylor Eng. & Mfg. Co., Allentown, Pa.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Link-Belt Co., Chicago, Ill.

POWDER
Du Pont de Nemours & Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

POWER TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

RAIL CLAMPS
McDermid Positive Rail Clamp Co., Chicago, Ill.

ROAD MACHINERY
Austin-Western Road Mach. Co., Chicago, Ill.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam, Electric and Gas
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SPROCKETS
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SPROCKET CHAIN
Webster Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Blaw-Knox Co., Pittsburgh, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.

TANKS, STEEL STORAGE
Blaw-Knox Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

TRANSMISSION MACHINERY
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

WASHERS, SAND AND GRAVEL
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The W. S., Cleveland, Ohio.

3 Gantry Cranes

and Other Equipment of Interest at these Brooklyn and Boston Sales

INCLUDED in the vast amount of Quartermaster equipment to be sold at auction in Brooklyn, N. Y., November 15th are three 5-ton Gantry Cranes in fair condition. These cranes are 2-boom, steel construction and consist of unloader and distributor with electric hoists and winches, 150 boxes of parts going with the outfit. The concern that can use this equipment will save a lot of money by getting in on this sale.

A lot of interesting miscellaneous equipment and commissary supplies can also be found in the Brooklyn sale and also the quartermaster sale to be held in Boston, November 17th. The catalogs give complete lists of the materials offered, the lots and quantities and all information concerning the sales. Send for them at once and find out where the various materials are located so you can arrange to inspect the items of interest preparatory to offering your bids at the sales.

Brooklyn, N. Y., Nov. 15—

Gantry Cranes and parts; Worthington Duplex Steam Pump; Electric Motors, 3 to 6 h.p.; Grain Bags; Hose, water, 2 in. 4-ply, 25-ft. sections; Copper Wire and Cable; Hand Gasoline Lamps; Scales, counter and Howe 600-lb.; Wire, 1¾ in. mesh, 78 in. wide; Chains, 5/16 in. links; Harness Sets; Commissary Supplies of all kinds. For catalog of sale write to Quartermaster Supply Officer, 59th St. and First Ave., Brooklyn, N. Y.

Boston, Mass., Nov. 17—

Boiler, single tube, Scotch; Machinist's Files; Lantern Globes, colored; Stable Forks; Rope, wire, tarred and cotton braided; Portable Wagon Loaders; Commissary Stores. For catalog and all terms of sale write Commanding Officer, Army Supply Base, Boston 9, Mass.

Send for Catalogs

for Brooklyn sale: Quartermaster Supply Officer, 59th St. and First Ave., Brooklyn, N. Y. For the Boston sale write: Commanding Officer, Army Supply Base, Boston 9, Mass.

WAR DEPARTMENT

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

Immediate Delivery

Send Us Your Shovel Inquiries

66x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
50-75 HP. Single Drum Hoists, 25 Cy. Motors.
25-50-80-110 HP. Electric Hoists.
Nos. 4-5-6-7½ & 9 CRUSHERS.
6 and 12 ton Gasoline Locomotives.
10x12 in. Steam Hoist, 3 Drum.
2-DISC CRUSHERS, 36-in. SYMONS, also 24-in.
100 TON 2½-YD. ELEC. SHOVEL.
50 to 5000 ft. Steam, Belt & Elec. Compressors.
JAW & ROLL CRUSHERS.
10-15 & 20 ton Locomotive Cranes.
13x30, 10x18, 9x14-in. and Other Jaw Crushers.
24x54 McCLANAHAN ROLL CRUSHER.
Columbus Portable Conveyor 25-ft. Eng. Drive.
Send us your inquiries for Engines, Centrifugal Pumps, Quarry & Contrs. Equip., Etc.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—¾ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

FOR SALE

Two No. 4 Semi-Vulcanite Williams Crushers at $1400.00 each, and two No. 5 McCulley Gyratory Crushers at $1500.00 each. All second hand but guaranteed to be in good condition.

Dewey Portland Cement Co.
Dewey, Oklahoma

DEPENDABLE SERVICE

Hyman-Michaels Co.

531 Peoples Gas Bldg., Chicago, Ill.

RELAYING RAILS AND ANGLE BARS

In All Weights, 30 to 100 Lb. to the Yd.

Quick Shipment
Dependable Service

Get Our Quotations Today

We Also Cut Rails to Lengths for Props, Etc.

OFFICES AT
New York City, 1324 Woolworth Bldg.
Pittsburgh, Pa., 1312 1st Nat'l Bank Bldg.
St. Louis, Mo., 2115 Railway Ex. Bldg.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½ x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

No. 5 Crushing Plant For Sale

We have in southern Indiana a No. 5 crushing and agricultural limestone plant for sale. This plant has a No. 5 Austin crusher, elevator and screen. Also a large size Day pulverizer. This is a good opportunity for a hustling crushing man.

Write Box 271, Muncie, Indiana

FOR SALE

One Broughton Plaster Mixer, Style B, No. 2. This machine has never been used. Write us.

THE SPEAKES COMPANY
415 North Griggs Street St. Paul, Minn.

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

Three Roll Bradley Pulverizer, complete with number of extra parts. In first class condition. A REAL BARGAIN. Write

P. O. Box No. 342, Geneva, N. Y.

1—59-ton standard gage Baldwin 6-wheel saddle tank switcher.
1—39-ton Baldwin 6-wheel switcher with separate tender.
1—50-ton standard gage Brooks 6-wheel switcher.
1—42-ton standard gage Shay geared locomotive.
2—18-ton 36-in. gage 4-wheel saddle tanks.
1—23-ton new 36-in. gage Porter 6-wheeler, with tender.
1—20-ton Industrial Locomotive crane.
1—14-B Bucyrus steam shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR RENT AND SALE

14—4-yd. 36-in. ga. heavy duty Western dump cars.
20—12-yd. Western air dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader, used sixty days.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, built 1920.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, built 1921.
2—Foote 40-S 1-yd. side discharge concrete mixers, with steam engine and boiler.
32—NEW 20-in. I beams, 80 lbs. per foot, 40 feet long, not drilled.
1—NEW Lakewood concrete chuting system.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Illinois

FOR SALE

One No. 18 Leyner-Ingersoll drill, complete with all fittings mounted. Machine has not drilled 100 ft. of hole. Too small for our work.

DIAMOND SLATE COMPANY, Inc.
Pen Argyl, Pennsylvania

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who will keep it going.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

FOR SALE

Unused Emerson Brantingham Double Cylinder Single Drum **Hoists** in first-class condition, f.o.b. Chicago, **$85** each. Immediate shipment. Full specifications furnished on application.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago

FOR SALE

2 8x110′ Rotary Kilns
6 5x6x7x110′ Rotary Kilns
8 5x21′ Tube Mills, Steel Lining
6 250 H.P. Oil City Water Tube Boilers
1 4′ 6″ x 40′ Coal Dryer
1 No. 5 Gates Crusher
8 Krupp Ball Mills
4 Engines, 200 to 500 H.P.
8 33″ Fuller Mills
Shafting, Pulleys, Bearings and Elevator Equipment, all in first-class operating condition.

50 Acres of Land and Five Buildings, Stone and Steel Construction.
Located at Stockertown, Pa.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

BIDS WANTED

on quarrying 400,000 cubic yards of limestone. Quarry is open and will take the rock as fast as turned out. Performance bond will be required. For further information address

411 Cotton Exchange Building
Houston, Texas

For Sale—Quarry

In Missouri town of 20,000. Four railroads serving Missouri and Illinois territory; 7½ acres land, 2 acres rock. Completely equipped for producing commercial crushed rock. Non-resident owner in other business. Will sacrifice for quick sale $5500. Real opportunity for practical quarry operator. Address

D. P. Lane, 302 Rialto Bldg., St. Louis.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

WANTED

To correspond with some cement or stone company in regard to position as quarry foreman. Had years of experience in large quarries. Can produce the goods. Best of references.

GEORGE HORTON
P. O. Box 447 Sedan, Kansas

WANTED

Thoroughly competent Superintendent to take charge large trap rock quarry located near New York City. Only reliable, capable man with good references need apply; steady position, good salary for proper man. Address

W. R. WILSON,
50 Church Street, New York City

WANTED

Superintendent of several years' experience with all kinds of crushing and separating machinery. Would like to locate with some good rock crushing and grinding plant or small cement plant. A permanent position desired.

Address Box 1595, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Night superintendent, cement plant in Middle West. State age, experience and salary expected. Address

Box 1596, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

George Borrowman, Ph.D.
CHEMIST

Analyses, consultations, researches in connection with rock products, cements, clays, lime, plasters, zeolites, sands, etc.

9 So. Clinton St. Chicago, Ill.

H. E. WIEDEMANN
(Est. 1905)
Consulting and Analytical Chemist

Specialist in Analysis of Rock Products

Chemical Bldg. St. Louis

POSITION WANTED

Experienced superintendent desires to make connection with large cement plant. Thoroughly familiar with operations and machinery. Permanent position desired. Address

Box 1597, Care of Rock Products
542 S. Dearborn St., Chicago, Ill.

POSITION WANTED

Superintendent desires engagement; thoroughly familiar with all details of sand and gravel plants. Twenty years' experience with steam and electric dredges. Can give the best of references. Address

Box 1593, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Powerful Baldwin Locomotives for heavy industrial service which can be used on light tracks

The locomotive illustrated is a good type for heavy service about big quarries, furnaces, steel plants and other industries where often the tracks are light and uneven. This locomotive of the 0-8-0 type, was built for the Upper Merion & Plymouth Railroad and is in daily service at Swedeland, Pa. It is used to haul cars loaded with ore to the blast furnaces of the Alan Wood Iron & Steel Company.

When in need of new power for any industrial purpose, you will get exceptional service when you specify Baldwin Locomotives.

A Baldwin Eight-Coupled Locomotive for Heavy Industrial Work
Cylinders, 25″ x 28″. Driving wheels, diameter, 51″. Weight, engine, 214,600 lbs. Tractive force, 51,200 lbs.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

900

The AMERICAN GAS-O-MOTIVE

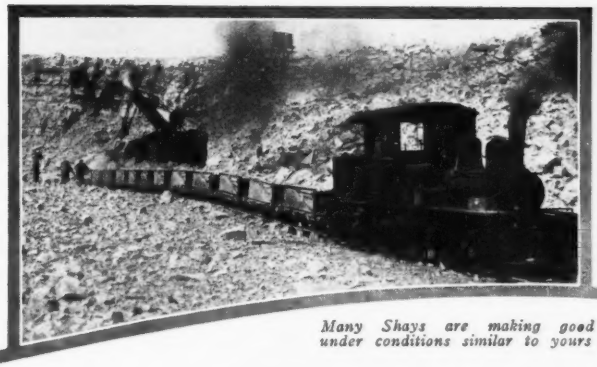
The American Gas-O-Motive bears within itself the elements that go to make a good investment.

Power, a high degree of economy, and durability, brought into proper relation and balance, contribute effectively to the lasting satisfaction that belongs so particularly to this machine.

It is made in sizes from 4 to 7 tons, for gauges ranging from 24 to 56½ inches, and has a draw bar pull of 1600 lbs.

Write for specifications and prices

THE HADFIELD-PENFIELD STEEL CO., Bucyrus, Ohio



Many Shays are making good under conditions similar to yours

GET THE MOST FOR YOUR DOLLARS

Every dollar spent for a Shay Geared Locomotive buys hauling power.

On a 6 per cent. grade, a 124,000 lb. Shay will pull more than twice as much as a rod-driven locomotive and tender weighing 240,000 lbs.

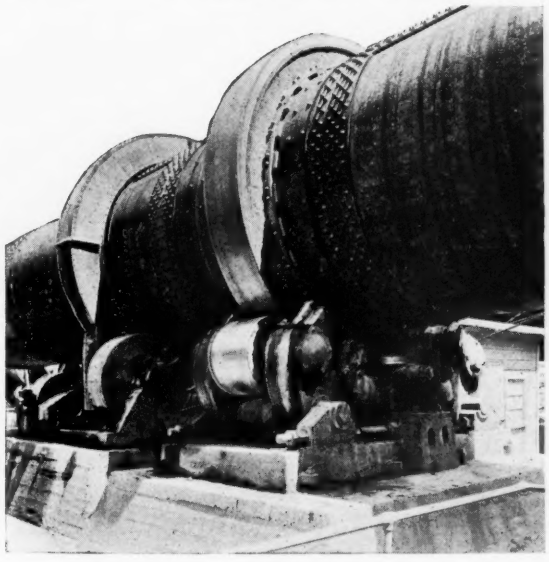
There is no dead weight on a Shay, no idle engine or tender trucks. Every Shay wheel pulls, even the tender wheels being connected to the flexible driving shaft.

For steady, economical hauling, particularly on grades, there is no more economical or better buy than a Shay Geared Locomotive. Ask us what you can do with a Shay.

LIMA LOCOMOTIVE WORKS, Incorporated

17 East 42nd Street, New York Lima, Ohio

Just to Show the Sturdy Construction of Vulcan Rotary Kilns



The installation is the Western States Portland Cement Company, Independence, Kansas. They operate four 9'0"x175'0" two-tire Vulcan Rotary Kilns.

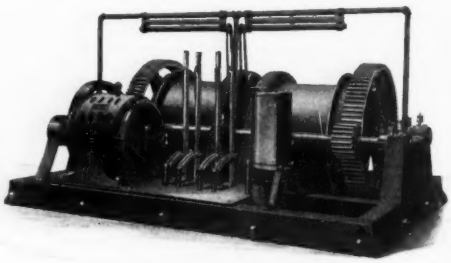
The tire and roller bearing supports under the tire, together with thrust roller bearings, are seen in the illustration. In front of the tire is the Girth gear with driving gear train. These are encased in steel plate gear-guards.

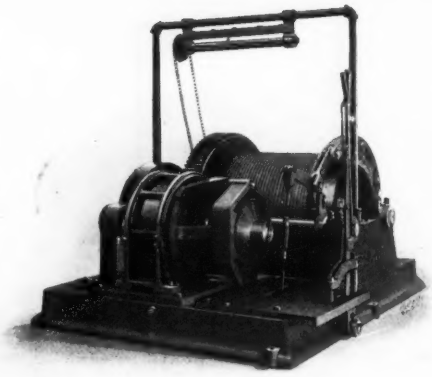
We will be pleased to go into further details of Vulcan Rotary Kiln construction; also to have our engineers work with you in your individual problems relating to kilns.

When you're interested in Kilns, write Vulcan

VULCAN IRON WORKS, Established 1849

1753 Main Street **Wilkes-Barre, Pa.**





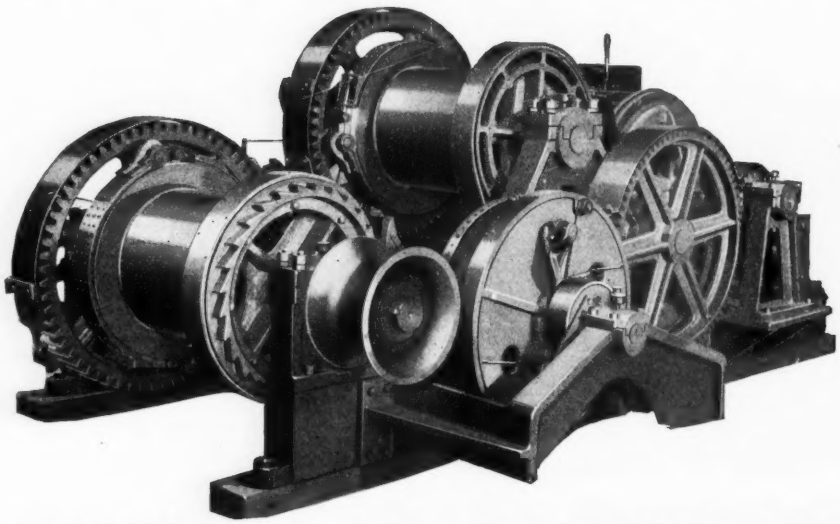
OTTUMWA HOISTS

If our success may be placed to the credit of any single factor, it is due to the close attention we have paid to our original business policy; to proceed always on the basis of FINEST QUALITY, allowing price to adjust itself to these exactions. Still, our long experience has given us a complete mastery of costs and production, enabling us to market these hoists at a price that successfully meets competition.

We maintain a corps of experienced and competent engineers for the purpose of helping you solve your haulage problems.

Ottumwa Iron Works, Ottumwa, Ia., U. S. A.

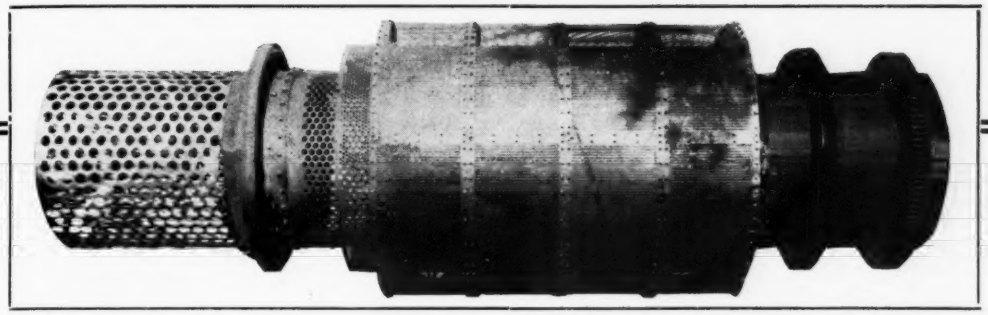
THOMAS HOISTS



For
Dragline Cableways
Drag Scrapers
Derricks
Bucket Operation
Car Haulage

THOMAS ELEVATOR COMPANY

27 South Hoyne Avenue **Chicago, Illinois**



Triple-jacketed trunnion type screen

Note the scrubber on this end of screen

Revolving Screens

We Manufacture

- **Bin Gates**
- **Automatic Feeders**
- **All Types of Screens**
- **Transmission Machinery**
- **Complete Belt Conveyors**
- **Complete Bucket Elevators**
- **Automatic Sand Settling Tanks**

Our single, double and triple jacketed revolving screens are probably the most outstanding examples of units which have been developed, detail by detail, in actual practice and application at our various plants during two decades.

These screens are made with or without scrubbers, as desired. The scrubbers are attached to, and are part of the screen at the feed end. They are simple in design, very efficient, and require almost no upkeep.

This type of screen is and has been used throughout all the plants of the Greenville Gravel Co. for twenty years, and we strongly recommend this unit to you for capacity, long life, low maintenance and efficiency

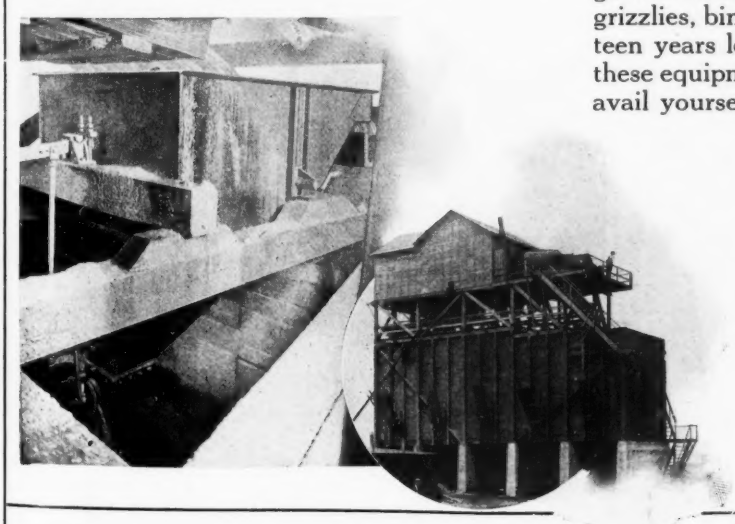
Write for Our Catalogs

The Greenville Mfg. Co.

"Specialists in Sand and Gravel Plant Equipment"

GREENVILLE, OHIO

TELSMITH GRAVEL PLANTS



Telsmith is the only manufacturer in the U. S. building a COMPLETE LINE of gravel plant equipment — primary and reduction crushers, bucket elevators, belt conveyors, gravel washers, sand tanks, automatic feeders, grizzlies, bin gates, etc. Telsmith has spent sixteen years learning how to build and combine these equipments for the best results. You can avail yourself of the experience thus accumulated. If you contemplate the development of a gravel pit, let Telsmith figure with you. Glad to send you (without obligation) Bulletin No. G-P-11. Write for it NOW before you forget.

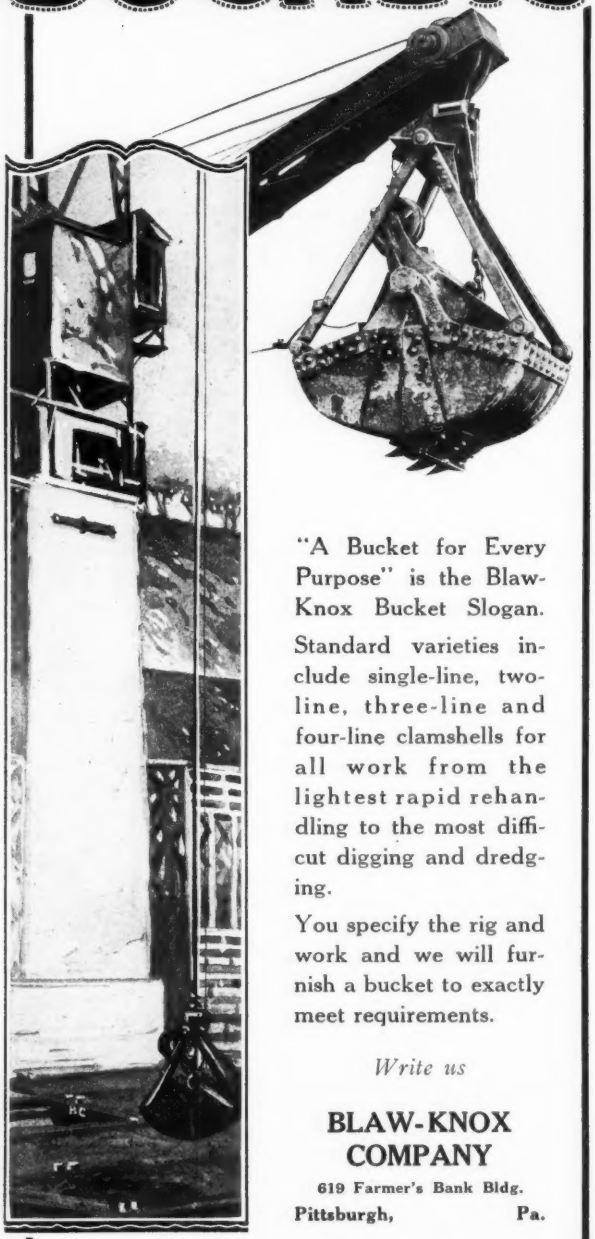
At right—Plant of Service Sand and Gravel Co., Rockford, Ill. This plant is equipped throughout with Telsmith crushing, elevating, washing and screening equipment.

At left—One of the Telsmith Sand Tanks, improved tilting type, in the plant of the Service Sand and Gravel Co.

SMITH ENGINEERING WORKS

3188 LOCUST STREET MILWAUKEE, WIS.

Digging and Re-Handling BUCKETS



"A Bucket for Every Purpose" is the Blaw-Knox Bucket Slogan.

Standard varieties include single-line, two-line, three-line and four-line clamshells for all work from the lightest rapid rehandling to the most difficut digging and dredging.

You specify the rig and work and we will furnish a bucket to exactly meet requirements.

Write us

BLAW-KNOX COMPANY
619 Farmer's Bank Bldg.
Pittsburgh, Pa.

New York Baltimore Birmingham
Chicago Detroit London, Eng.

BLAW-KNOX BUCKETS

Haiss Buckets

Strong—Sturdy—Powerful

The kind that stand up under the hardest service, while doing all the work you have a right to expect.

They are built heavy and with a high closing power ratio — the hardest material quickly crumbles under their powerful jaws and they grab a full load every trip.

For Rehandling or Hard Digging, where speed and capacity are wanted, you can safely use the *Haiss Bucket.*

The arms are big steel castings, not thin plates; the braces across the back of the bowl are also heavy steel castings; the connecting rods are solid forged steel, round; the flat link side chains are steel, bolted, not riveted; the cutting shoes are broad and heavy bronze bushings are used in all bearings.

It is the ideal bucket for you, because it will do a lot of work and give you no trouble. Bulletin No. 719 describes Haiss Buckets.

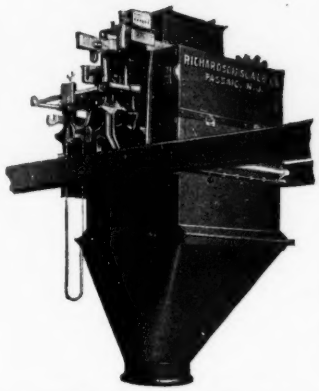
The George Haiss Mfg. Co., Inc.
139th St. and Park Ave., New York
Established 1892
Representatives throughout the world

H-114

HAISS
MATERIALS-HANDLING EQUIPMENT
CLAM SHELL BUCKETS

Improved Accuracy, Convenience and Speed in Weighing and Sacking Pulverized Materials

Gypsum, Plaster, Magnesite, Lime, Stone, Cement can be Weighed Automatically in this Totally Enclosed Dustproof Machine



IT'S A

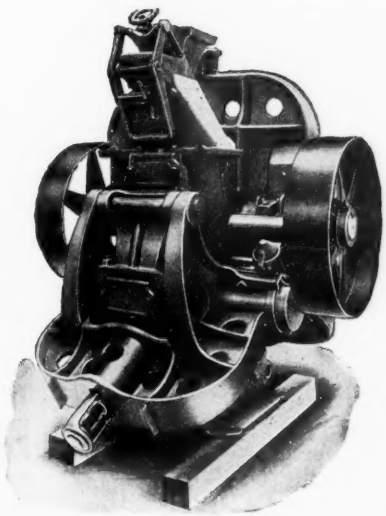
RICHARDSON AUTOMATIC

Sustained Accuracy Guaranteed Under Heavy Service

Continuous records of production mechanically registered for all shifts. **Saves labor of Weighman.** Prevents loss of material by avoiding overweights. Convenient to operate. A practical proposition for many industries.

RICHARDSON SCALE COMPANY, Passaic, New Jersey

New York Boston Buffalo Chicago San Francisco



MAXECON

Preliminary Grinder for Tube Mills

LIMESTONE ..... 20 to 40 Mesh
CEMENT CLINKER ..... 20 to 60 Mesh

MAXECON MILL
PERFECTECON SEPARATOR

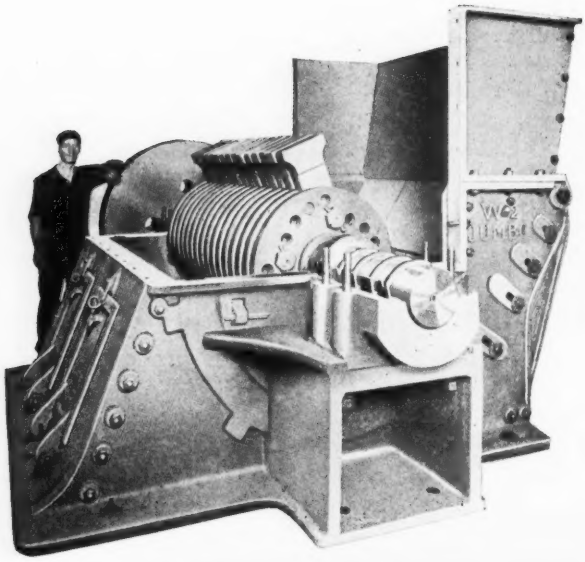
The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.

It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

Drop us a line **We will be glad to tell you about it**

Kent Mill Company

10 Rapelyea Street **BROOKLYN, N. Y.**



One Crusher Instead of Four

Operating on a 32 to 1 crushing ratio reducing limestone 4 feet square by 4 and 5 feet long to 1½ inches and finer in ONE REDUCTION Williams Mammoth crushers are setting new cost records in rock crushing. In most cases they reduce the initial investment 50 per cent or more as a single Mammoth crusher takes the place of a preliminary crusher and 2 or 3 secondary crushers in addition to eliminating the conveyors and elevators for carrying the rock through the successive crushing steps.

Crushes to Size You Wish

A remarkable feature of the Mammoth is its ability to crush to the size desired with an unusually small percentage of undersize or oversize material. For example, John Herzog & Sons, Forest, Ohio, say: "We make less fines than we did on our Jaw Crusher." On the other hand where fine material is desirable, the crusher can be adjusted accordingly. Describe your work to the Williams Engineering Department. They will gladly furnish full details on this modern method of rock crushing applied to your use.

Williams Patent Crusher & Pulverizer Company
800 St. Louis Ave., St. Louis, Mo.

Chicago, 37 W. Van Buren Street — New York, 15 Park Row — San Francisco, 67 Second Street

Williams

PATENT CRUSHERS GRINDERS SHREDDERS

Here is the Solution to Your Fine Grinding Problem

Many of the leading concerns have found the solution to their fine grinding problems on Gypsum, Cement, Talc and Soapstone, Graphite, Limestone and similar materials by installing

MUNSON
Under Runner Buhr Mills

There is practically no limit to the degree of fineness to which these mills will grind these products. They will do the work economically and satisfactorily in every way. Solid in construction—will do away with delays and shut-down and keep out of the repair shop. Their Automatic Adjustment, Rapid Grinding and Perfect Balance Insure good results and fine and uniform grinding.

Why not investigate? Send for our new catalog, number 71

MUNSON
Mill Machy. Co., Inc.
Utica, New York

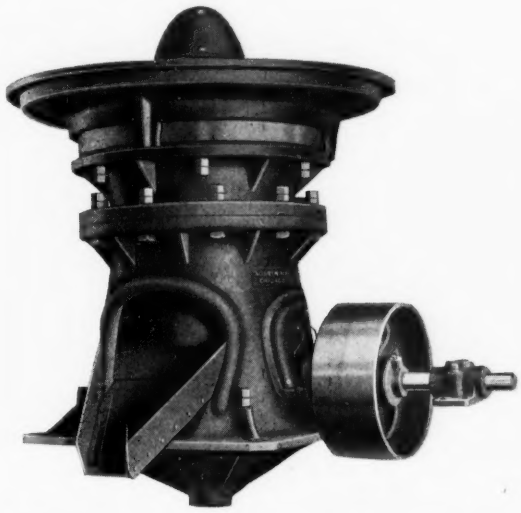
Everybody's Happy

By crushing, screening and storing rock obtained from nearby fields during the past winter, the Highways Improvement Company of South Bend, Ind., secured the material for a six-mile contract much cheaper than if they had had it shipped in, and at the same time kept their organization together and got rid of field stones and made money for the farmers in the district where the road was built.

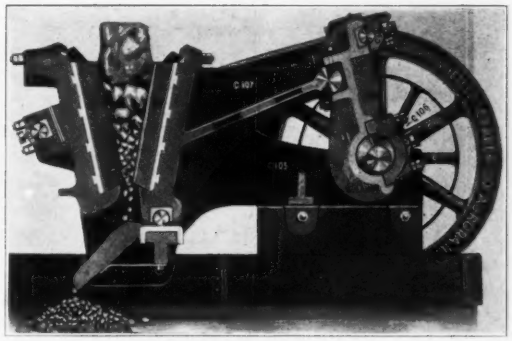
A survey of the farms along the road was made after the contract was awarded and it was decided that enough stone could be secured from the fields to make it pay to put in a portable crushing and screening plant. The plant was set up at the middle point of the new road, and stone hauled in by farmers from within a radius of four miles.

Crushing and screening reduced the stone to four sizes, ranging from dust to 4 in. The several sizes were stored in separate piles more than 20 ft. high by means of the conveyor, so little ground space was required and the material was in shape to be reclaimed quickly when taken out for the road.

Catalog 29-T tells all about the No. 3 Austin Portable Gyratory Crushing and Screening Plant that helped to make this such a profitable venture. Write for your copy now.



AUSTIN MANUFACTURING CO.
New York Chicago San Francisco



WESTERN - AURORA

The Jaw Crusher That is Different

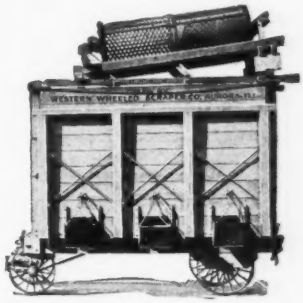
Different in design. Look at the sectional view. Not a time-wasting spring to break, or toggle to fall out.

Also—and what is even more important—a continuous double-stroke crushing motion which increases capacity, reduces vibration and economizes power.

The Western-Aurora Crusher is different in many ways that serve to speed up the work and fatten your pocketbook; and other units of the complete crushing and screening plant are on a par with it. Elevator, screen and bin—all are of the most substantial construction.

A Western-Aurora Crushing Plant is a mighty fine investment from every angle.

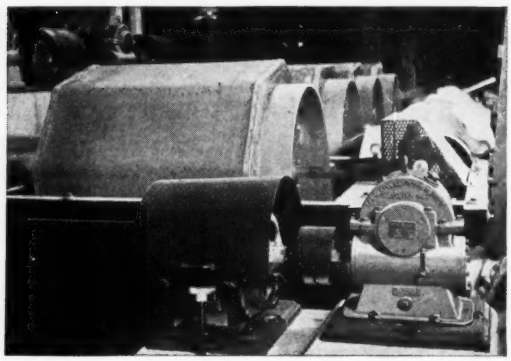
Other reasons are found in Catalog 44-T. We would like to send you a copy



THE AUSTIN-WESTERN ROAD MACHINERY CO.
Chicago, Illinois

Branches in 22 Cities
"Everything from a Drag Scraper to a Road Roller"

Cleveland
WORM GEAR REDUCTION UNITS



Cleveland Worm Gear Reduction Units applied to Pulp Thickeners. Motor 3 HP. at 860 R.P.M. Reduction in worm drive 32 to 1

Why Not Investigate

Cleveland Worm Gear Drives?

We are much interested in the application of worm gear drives to the needs of the rock products industry.

Frankly, we are of the opinion that you can effect substantial savings through the use of these drives.

Thus we solicit the opportunity to place our drives in competition with any similar devices now used by you.

Experience in other industries where the service is much more severe indicates that the Cleveland Worm Gear Speed Reduction Units will outlast and outperform any other type of drive.

They will not only cost less for maintenance but will also show greater efficiency in the transmission of power.

They take up less space and permit a right-angle drive.

They operate with less noise—you can't imagine how amazingly quiet they are until you have them in your plant.

They permit the use of high speed motors—many plants have standardized on high speed motors with Cleveland Worm Gear Drives and show a substantial saving.

Where these drives are used, improved electrical efficiency is invariably indicated.

Another feature which is appreciated by operators is the even flow of torque.

We solicit the opportunity to make a sample installation. Like many other plants, you may at this moment be in the market for just one drive.

We are quite willing to rest our case for the future upon the performance of any drive that we recommend for the job, and we would be glad to have you get in touch with us with reference to your needs.

The Cleveland Worm & Gear Co.

America's Worm Gear Specialists

CLEVELAND, OHIO

DRAVO-DOYLE CO. ..... Pittsburgh, Cleveland, Indianapolis, Philadelphia

New England Representatives

FRANKLIN MACHINE CO. ..... Providence, R. I.

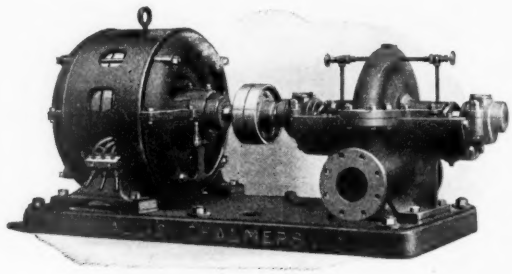
Pacific Coast Representatives

ALFRED H. COATES CO. ..... San Francisco, Cal.

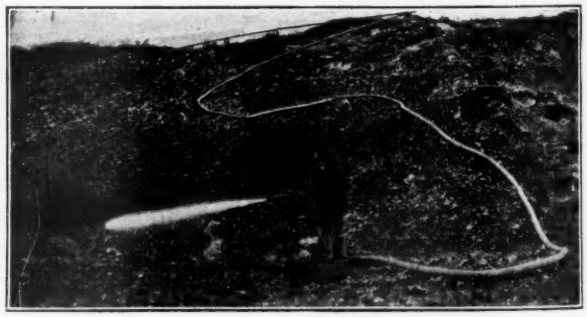
Rocky Mountain States Representatives

THE VULCAN IRON WORKS CO. ..... Denver, Colo.

CENTRIFUGAL PUMPS
FOR
ROCK PRODUCTS INDUSTRIES



The successful application of Allis-Chalmers pumping units to the various kinds of pumping done in the Rock Products industries make the use of similar pumps for your requirements worth careful consideration. The combined units of undivided responsibility consisting of Allis-Chalmers pumps driven by Allis-Chalmers motors as described in our latest bulletin will be found adaptable and useful as gravel washing pumps, drainage pumps, stripping, etc. If you do not have our centrifugal pump bulletin 1632-E it will be sent on request and will be found to contain information of value in the consideration of pumping work.



ALLIS-CHALMERS
MANUFACTURING COMPANY

ELECTRICAL MACHINERY
STEAM TURBINES — STEAM ENGINES
HYDRAULIC TURBINES
GAS ENGINES — OIL ENGINES
MINING MACHINERY
CRUSHING AND CEMENT MACHINERY
FLOUR AND SAW MILL MACHINERY

PUMPING ENGINES
CENTRIFUGAL PUMPS
CONDENSERS
AIR COMPRESSORS — AIR BRAKES
STEAM AND ELECTRIC HOISTS
AGRICULTURAL MACHINERY
POWER TRANSMISSION MACHINERY

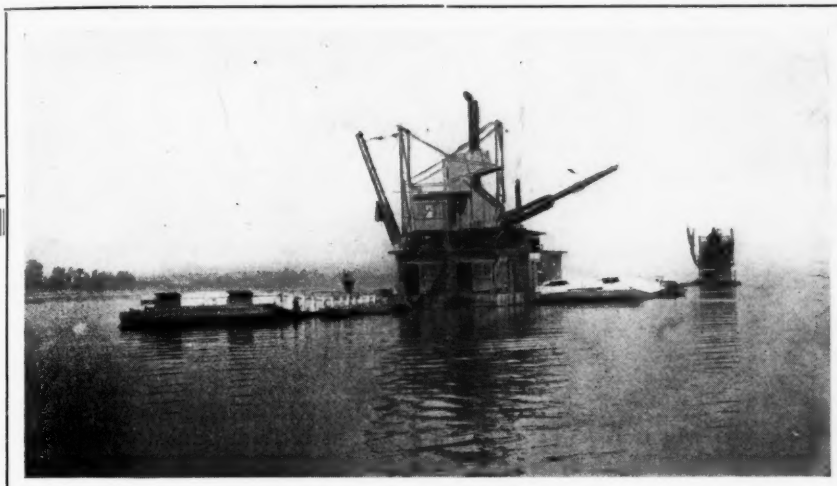
MILWAUKEE, WISCONSIN. U.S.A.

Great Capacity

AMSCO

PUMP

The engraving shows and illustrates the new "Digger" owned and operated by H. H. Halliday Sand Company, Cairo, Illinois. Experts say this "Digger" is the most elaborate and well equipped boat on the Ohio River. It is equipped with a 10-in. AMSCO pump connected to a 150 HP. steam engine, and a six-car capacity is dredged in two hours and fifteen minutes.



Capacity and satisfaction always follow an AMSCO installation.

AMERICAN MANGANESE STEEL CO.
398 East 14th Street
CHICAGO HEIGHTS, ILL.

WELLER-MADE EQUIPMENT

For Handling the Materials Mechanically

Increase the Output and Reduce Costs by Employing Weller-Made Machinery to Do the Work

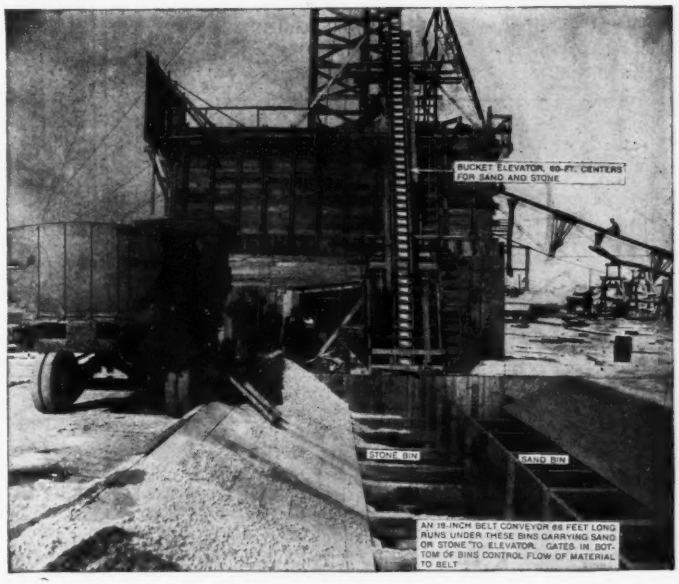
It is sturdy and reliable. Never lays down on the job. The cost of operation is small. Will help pay dividends.

We Make
Conveyors of All Types

Bucket Elevators	Portable Elevators
Steel Storage Bins	Bin Gates
Screens	Sheet Metalwork, etc.

WELLER MADE CHICAGO

Write and let us know the kind of equipment you are interested in or the material you want to handle. Catalogues showing installations, also data to help in selection of equipment, will be sent.

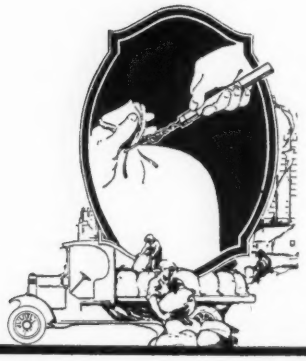

BUCKET ELEVATOR, 60-FT. CENTERS FOR SAND AND STONE
STONE BIN
SAND BIN
AN 18-INCH BELT CONVEYOR 66 FEET LONG RUNS UNDER THESE BINS CARRYING SAND OR STONE TO ELEVATOR. GATES IN BOTTOM OF BINS CONTROL FLOW OF MATERIAL TO BELT

WELLER MFG. CO.

1820-1856 North Kostner Avenue — Chicago, Illinois

SALES OFFICES

New York · Boston · Baltimore · Pittsburgh · Cleveland · San Francisco · Salt Lake City



BATES WIRE TIES

have long since been universally accepted as the most secure, saving, and efficient means for closing bags of all sizes and descriptions.

OVER THREE HUNDRED MILLION BAGS were closed the Bates Way during 1921 in the Rock Products Industries alone.

A Free trial of Bates Wire Ties will convince you and will show you how we save time and money for our big family of satisfied customers.

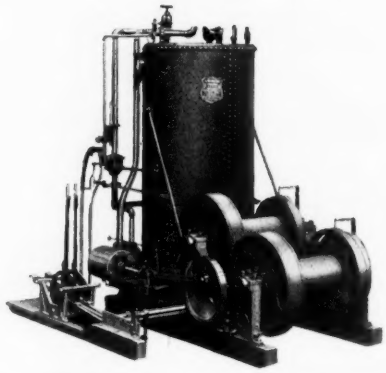
A Free Trial Outfit

consisting of one tying tool and liberal samples of wire ties suitable for your purposes will be gladly sent upon receipt of your agreement to try it on your work and within fifteen days send us $3.50, the price of the tying tool, or return it to us. The sample wire ties cost you NOTHING.

BATES VALVE BAG COMPANY

7328 South Chicago Ave. Chicago, Ill.

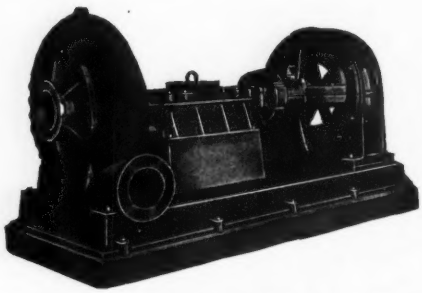
110 Great Portland St. London, W. I., England



The "AMERICAN" Two-Speed Hoist was designed and built to produce the highest possible daily yardage with a slackline dragline excavator. The front drum has two speeds—plenty of power to pull the bucket through the material while filling, and plenty of speed to hustle it from pit to hopper in the shortest possible time. This drum has two frictions, both operated by the same hand lever.

This is a powerful, speedy hoist. Its use means a sure reduction in digging and handling costs.

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4 in. up, arranged for belt, motor, or engine drive.

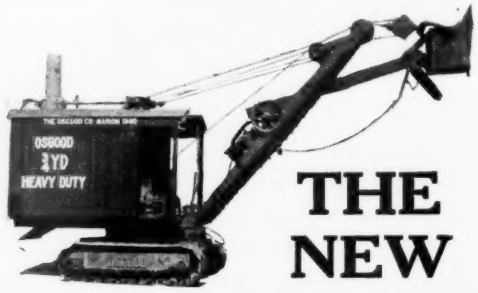
MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

39 Cortlandt St., New York City
Forrest Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines



THE NEW OSGOOD

The OSGOOD ¾ yd. Heavy Duty has an instant responsiveness—a snap in action—an easy confident manner of tackling the toughest job—imparting no sensation of working to the limit of strength—qualities that can only result from abundant vitality and reserve strength.

The Traction or Continuous Tread Mountings are of improved design. Quick Acting Power Steering Devices, Horizontal Hoisting Engines, Vertical Submerged Tube Type Boilers, all help to get out the most work for the fewest dollars.

Crane, Clamshell or Dragline features can be embodied in their construction, or quickly applied in the field.

The OSGOOD Company
MARION, OHIO, U. S. A.

"A WILLING WORKER"

It is sometimes difficult to get the first olive out of the bottle, but after you get the first one the rest comes easy.

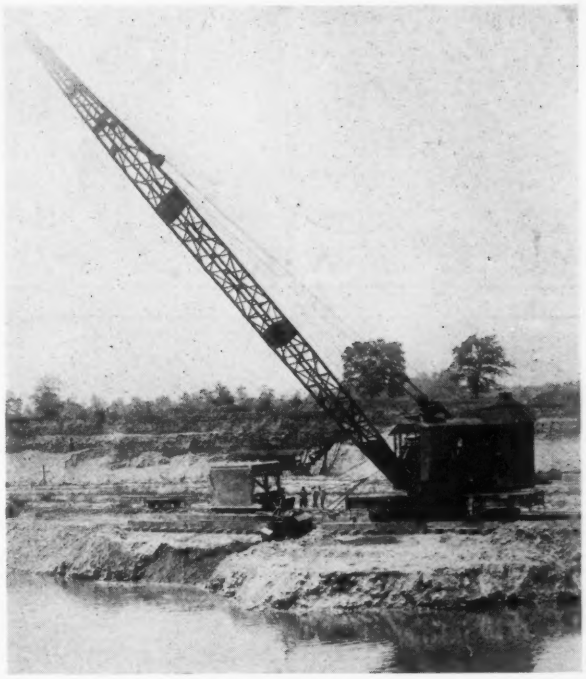
It's the same in selling Type "J" Locomotive Cranes. Sell one Type "J" and repeat orders follow.

WHY?

Because it is a regular "honest to goodness" crane, big by comparison, both in size and service.

It is human nature to like a willing worker, one that does a full day's work, day after day, without interruption or without coaxing.

Try out the type "J" and its operation will speak more convincingly than anything that can be said of its merits.

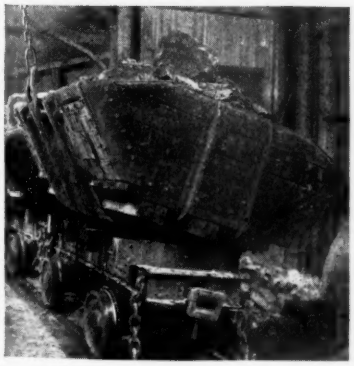


The McMyler Interstate Company
Cleveland, Ohio LC-108

BRANCH OFFICES:

New York City	1756 Hudson Terminal Building
Chicago, Illinois	812 Edison Building
Seattle, Washington	Hoge Building
Denver, Colorado	18th and Wazee Streets
San Francisco, California	766 Folsom Street
New Orleans, Louisiana	444 Maison Blanche Annex
Birmingham, Alabama	Brown-Marx Building
Boston, Massachusetts	261 Franklin Street

EASTON QUARRY CARS



"Quarry Car Practice," a 96-page picture bulletin covering an investigation of Quarry Work under many conditions, promptly sent to any Quarry Man.

Won-Way DUMP CAR TYPE "E"

Built for Big Quarries and Shovel Loading

EASTON INDUSTRIAL CARS

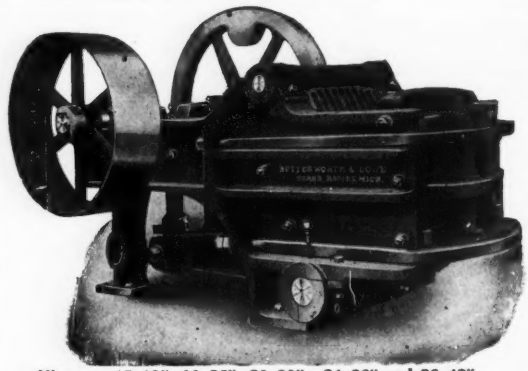
Reinforced Flat Bottom and Sloping Sides—Loading and Unloading Made Easy—No Need to Balance the Load—No Accumulation in Bottom of Car—Car Height cuts down Dipper Travel — Practically Proof Against Derailment — Works Equally Well Singly or in Trains—Fool Proof, Trouble Proof, Almost Wear Proof.

28 HOLLEY ST., EASTON, PA.

New York Philadelphia Pittsburgh St. Louis
Norfolk Savannah Birmingham
Salt Lake City Los Angeles

EASTON CAR & CONS'T'N CO

2179-E



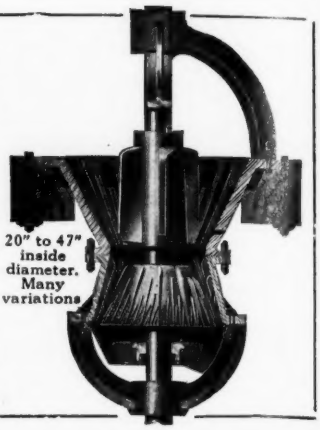
Nippers—17x19", 18x26". 20x30", 24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

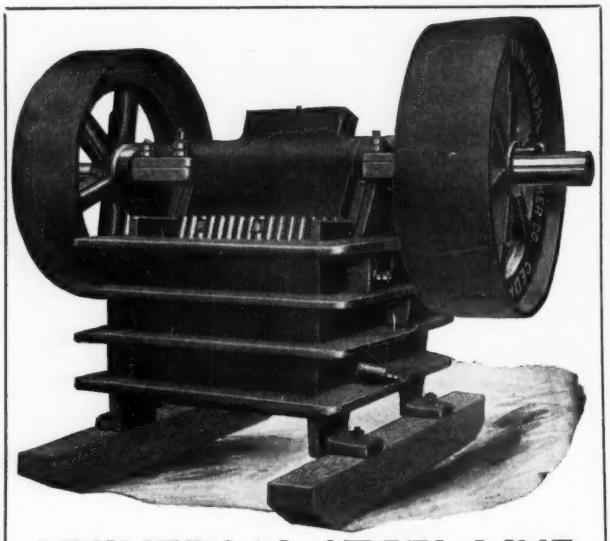
Special Crusher-Grinders for Lime



20" to 47" inside diameter. Many variations

Butterworth & Lowe

17 Huron St. Grand Rapids, Mich.



UNIVERSAL STEEL LINE

THE PERFECT GRAVEL AND REJECTION CRUSHER

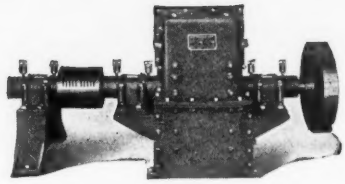
Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.

"K-B" ALL-STEEL PULVERIZER



High Production
Low Power Cost

The efficiency of any machine lies in its ability to do a large amount of work with a small consumption of power.

The "K-B" does this!

Ask us for full information

K-B PULVERIZER

K-B Pulverizer Company, Inc.
92 Lafayette Street, New York

KEEP UP WITH THE ROCK PRODUCTS INDUSTRY

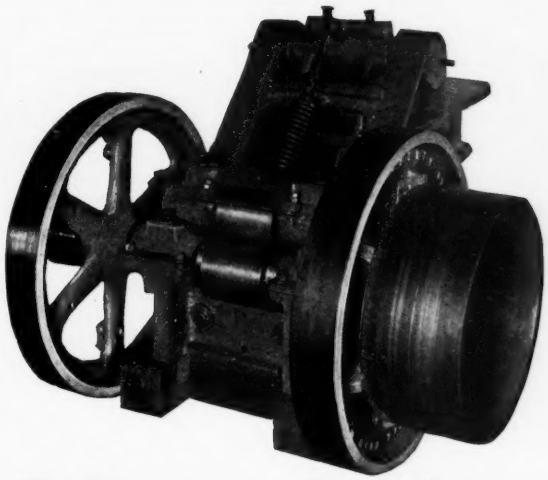
TIME and money are saved and won by keeping up with the progress of industry. Changing conditions, methods, prices must be reckoned with to win success. **Rock Products** is the authoritative source of business and technical information in the rock products industry. It is edited from the field by experienced practical men.

Subscribe now and get in correspondence with our service and advisory departments.

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

Crushing, Grinding, Pulverizing,
Screening, Sizing, Air Separating, Mixing,
Weighing, Elevating and Conveying Machinery
Complete Units -:- -:- Engineering Service

STURTEVANT MILL CO. HARRISON SQUARE BOSTON, MASS.



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

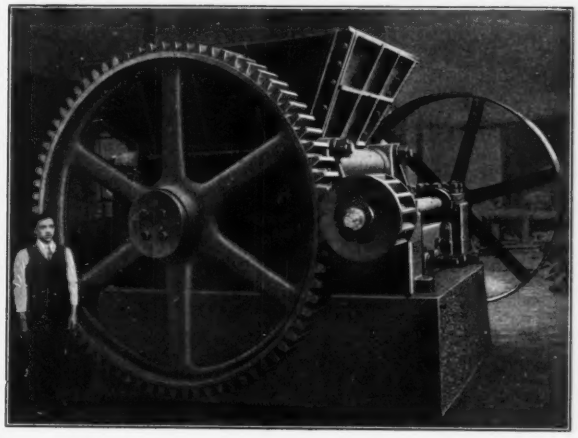
BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.

Branches in all principal cities in U. S. and Canada

MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

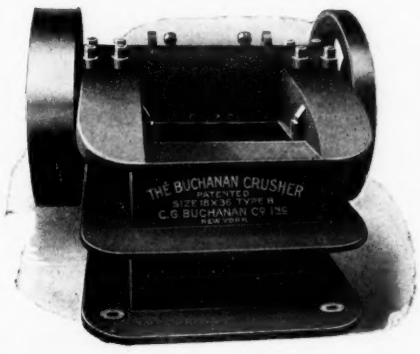
After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.

Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



BUCHANAN ALL-STEEL CRUSHER

Type "B" Jaw Crusher

Frame is a solid casting of open-hearth steel in one piece having a tensile strength of 60,000 to 65,000 lb. per square inch, three or four times stronger than cast iron and with at least three or four times the rigidity of the built-up rolled steel-plate crusher.

Jaw and Cheek Plates are of the best Manganese Steel, made reversible for double wear—Adjustable Jaw Stroke—Shim Adjustment—Safety Toggle—Reversible Steel Toggle Seats—Phosphor Bronze Frame Bearings (in smaller sizes)—Steel Swing Jaw and Pitman—Pitman water jacketed and parting in larger sizes.

Built in sizes up to 18" x 36".

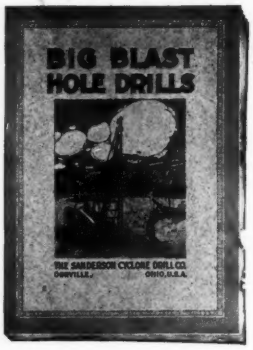
Large Crushers, Crushing Rolls, Complete Crushing Plants

Write for Bulletin No. 9

C. G. BUCHANAN COMPANY, Inc.

Cedar and West Streets, New York City

When writing advertisers please mention ROCK PRODUCTS



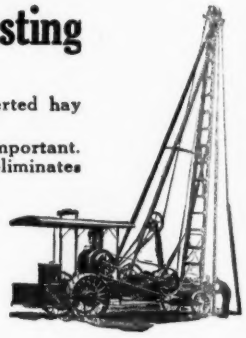
Analyze Your Drilling and Blasting

Our new Blast Hole Catalog B-46 (96 pages) will help you.

The day of poking a hole down with a rivet header or a converted hay bailer is past.

Drilling, being the first step in stone production, is the most important. One cent or one-half cent per ton cost saved in this operation often eliminates competition.

With Cyclone No. 14 Drills on the job and Cyclone Service in reserve, your drilling and blasting troubles fade—and your costs will be right.



THE SANDERSON-CYCLONE DRILL CO.
Orrville, Ohio
Eastern and Export Office, 30 Church St., New York

The Clyde Lime Hydrator Performance Counts

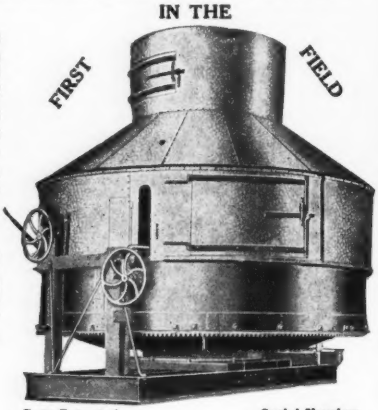
The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

IN THE FIRST FIELD

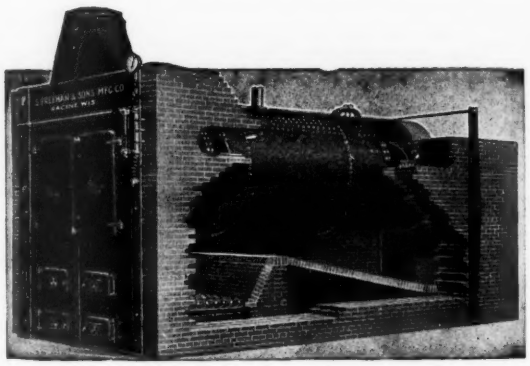


Send for Catalog

Date Patented	Serial Number
April 3, 1900	646544
October 10, 1905	801329
November 29, 1921	1398238

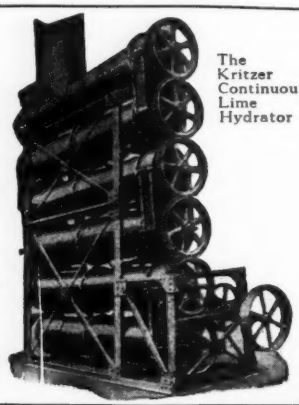
H. MISCAMPBELL
Patentee and Sole Manufacturer
DULUTH - - MINNESOTA

FREEMAN Horizontal Return Tube High Pressure Boiler



Write for descriptive illustrated catalogue

Freeman Manufacturing Co.
Main Office and Works, Racine, Wisconsin, U. S. A.



The Kritzer Continuous Lime Hydrator

HYDRATE

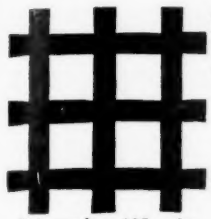
Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
503 South Jefferson Street CHICAGO, ILL.

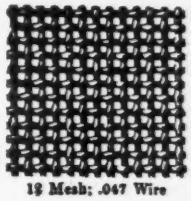
"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH



2½ mesh; .105 wire

A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT



1¢ Mesh; .047 Wire

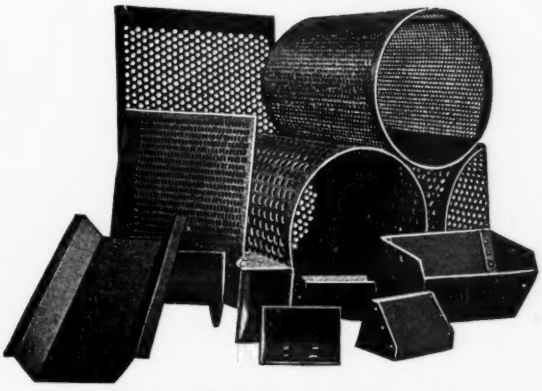
THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY

3573 East 78th Street **Cleveland, Ohio**

Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



ELEVATOR BUCKETS

PLAIN AND PERFORATED

General Sheet and Light Structural Work

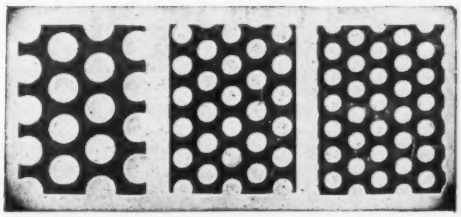
"Light and Heavy Steel Plate Construction"

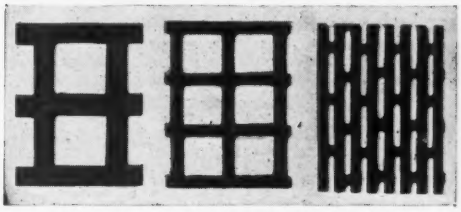
HENDRICK MFG. CO.

CARBONDALE, PA.

New York Office, 30 Church Street
Pittsburgh Office, 544 Union Arcade Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

Perforated Steel Screens





For Screening Stone, Gravel, Sand and Cement

All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

THE HARRINGTON & KING PERFORATING CO.

621 N. Union Ave., Chicago, Ill.

NEW YORK OFFICE: 114 Liberty St.

CROSS ENGINEERING CO. CARBONDALE, PA. CE PERFORATED SHEET METALS

Perforated Steel Screens

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pa.

J. C. BUCKBEE COMPANY
Engineers *and* Contractors
CHICAGO, ILL.

Design and build cement plants, rock crushing plants, power plants and industrial structures.

Examinations, Reports and Valuations of Industrial Properties

WE DESIGN AND EQUIP COMPLETE PLANTS

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.
Engineers, Machinists and Founders
Enterprise, Kansas
Western Sales Representative
J. J. Abramson, 612 San Fernando Bldg., Los Angeles Calif.

Engineering Service—

This organization designs and builds Lime and Hydrated Lime, Cement and Plaster plants after we have made a scientific study of each proposition.

Richard K. Meade & Company
11 E. Fayette St. Baltimore, Md.

Robert W. Hunt Jno. J. Cone D. W. McNaugher

ROBERT W. HUNT & CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

CHICAGO
2200 Insurance Exchange
New York St. Louis Kansas City Cincinnati Pittsburgh San Francisco

CARS

WE MAKE CARS FOR COAL, ORE, STONE, SAND, GRAVEL, CLAY AND BRICK. DRYER AND INDUSTRIAL CARS. THE WATT FACTORY IS THE LARGEST IN THE WORLD DEVOTED ALONE TO CAR BUILDING OVER 50 YEARS' EXPERIENCE

CATALOGS

The Watt Mining Car Wheel Co.
BARNESVILLE, OHIO

World famous for shafting and machinery lubrication!

Albany Grease

"All Men Know It Knowing Men Use It"

At Your Dealers!

Adam Cook's Sons
708-710 Washington St., New York

A MARK known and respected around the world — Since 1868 — for fair dealing, a quality product and an unexcelled service

ANCHOR BRAND COLORS

For Mortar, Cement and Brick—Brown, Black, Red and Buff —Strongest and Most Durable

Manufactured by

C. K. Williams & Co.
Correspondence Solicited EASTON, PA., U. S. A.

METRO NITE

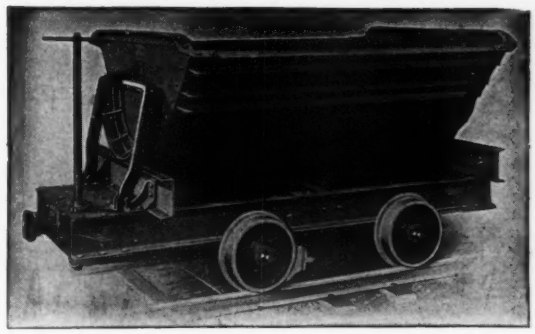
for Stucco

Metro-Nite White is a siliceous dolomite, extremely hard, sharp, cleanly graded and makes a bright, sparkling face for stucco buildings, concrete bricks or blocks.

It is generally accepted as the most beautiful and artistic facing known for this purpose, and we will gladly send samples to anyone who is interested in carload lots.

Metro-Nite can be delivered either in white or green.

THE METRO-NITE CO.
333 Hartford Ave., Milwaukee, Wis.

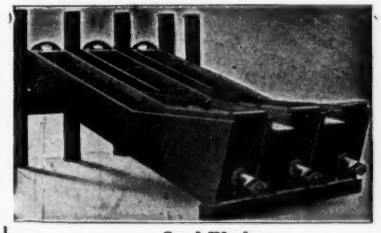


More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.



Sand Washers

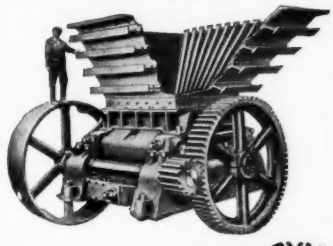
9-Foot Dry Pan

Lewistown Foundry & Machine Co.
LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog

"PENNSYLVANIA" Single Roll Crusher



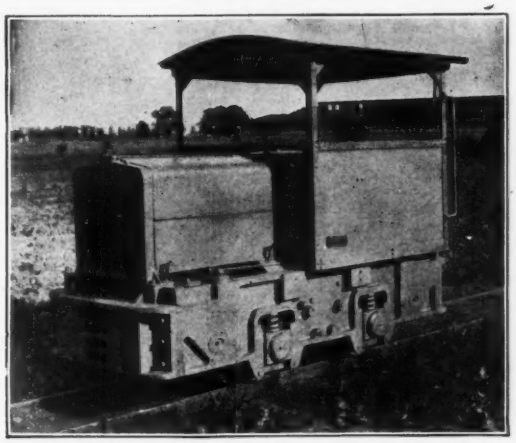
The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Bldg., Philadelphia

New York
Pittsburgh

WHITCOMB LOCOMOTIVES



QUARRIES—CEMENT PLANTS—BRICK PLANTS

The success of Whitcomb locomotives in hundreds of plants speaks of their thoroughness of design and construction and dependability in time of need. We would be glad to tell you what they are doing for others.

Whitcomb locomotives are designed to work and built to overwork

WRITE TODAY FOR BULLETINS

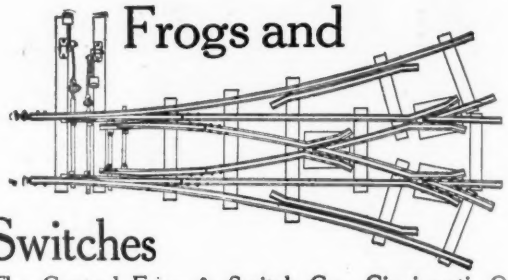
GEO. D. WHITCOMB COMPANY
Rochelle, Ill., U. S. A.

The Morgan Producer Gas Machine

is the highest class gas producer built in the U. S. and is advertised in this journal the second issue of each month.

Morgan Construction Company
Worcester, Mass.
Pittsburgh Office: 704 Arrott Bldg. Telephone Court 1381

Frogs and Switches



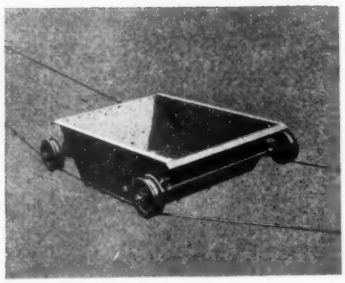
The Central Frog & Switch Co., Cincinnati, O.
Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fish Plates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

We Look Into the Earth

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all minerals.

We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.



Automatic Aerial Tramway

The Costs of
Installation
Maintenance
and
Operation
Justify its use at mine or quarry

INTERSTATE EQUIPMENT CORP.
25 Church Street New York City

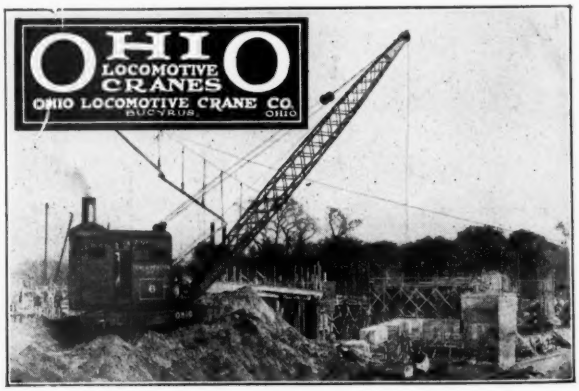
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers



TrucKranE

Drive Your Crane to Work!

The Byers "Truckrane" can be driven to work just like any automobile. Saves time and expense on every job. One owner recently refused $50.00 rental per day for a two weeks job in Chicago. Ask for "Truckrane" Bulletin.

THE BYERS MACHINE COMPANY
310 Sycamore Street, Ravenna, Ohio
Builders of Full Circle Cranes, "Auto-Cranes," Buckets, Hoists, etc.

When in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our readers. Use it.

Rock Products

The Nation's Business Magazine of the Rock Products Industry

542 So. Dearborn St. Chicago, Illinois

INDEX TO ADVERTISEMENTS

Allis Chalmers Mfg. Co. ... 72
American Hoist and Derrick Co. ... 74
American Manganese Steel Co. ... 73
American Process Co. ... Inside back cover
American Steel and Wire Co. ... 84
Atlas Car and Mfg. Co., The ... 81
Austin Mfg. Co. ... 71
Austin-Western Road Mach. Co. ... 71

Baldwin Locomotive Works ... 64
Bates Valve Bag Co. ... 74
Bland Engineering Co. ... Inside back cover
Blaw-Knox Co. ... 68
Brown Hoisting Machinery Co. ... 1
Buchanan Co., C. G. ... 77
Buckbee Co., J. C. ... 80
Bury Compressor Co. ... 84
Butterworth & Lowe ... 76
Buyers' Directory ... 58-60
Byers Machine Co., The ... 82

Central Frog & Switch Co. ... 82
Classified Advertising ... 63
Cleveland Wire Cloth and Mfg. Co. ... 79
Cleveland Worm and Gear Co., The ... 72
Cook's Sons Co., Adam ... 80
Cross Eng. Co. ... 79

Du Pont de Nemours, E. I., & Co. ... 3
Easton Car and Construction Co. ... 75
Edge Moor Iron Co. ... 57
Ehrsam & Sons Co., J. B. ... 80
Eicher, H. R. ... 56
Erie Steam Shovel Co. ... 5

Fate-Root-Heath Co. ... 12
Flory Mfg. Co., S. ... 84

Freeman Mfg. Co. ... 78
Grasselli Powder Co. ... 6
Greenville Mfg. Co. ... 67

Hadfield-Penfield Steel Co. ... 64
Haiss Mfg. Co., The Geo. ... 68
Harrington & King Perf. Co. ... 79
Hendrick Mfg. Co. ... 79
Hunt, R. W., & Co. ... 80

Interstate Equip. Co. ... 82

Jaite Co., The ... Inside back cover
Jeffrey Mfg. Co., The ... 10

Kennedy Van Saun Mfg. and Eng. Corp. ... 9
K-B Pulverizer Co., Inc. ... 76
Kent Mill Co. ... 69
Kritzer Co., The ... 78

Leschen & Sons Rope Co., A. ... Inside back cover
Lewistown Fdy. and Mach. Co. ... 81
Lima Locomotive Works ... 65
Link-Belt Co. ... Back cover

Marion Steam Shovel Co. ... 7
McDermid Positive Rail Clamp Co. ... 84
McLanahan-Stone Machine Co. ... 77
McMyler Interstate Co. ... 75
Meade & Co., R. K. ... 80
Metro-Nite Co. ... 81
Miscampbell, H. ... 78
Morgan Construction Co. ... 82
Morris Mach. Co. ... 74
Mundy Hoisting Engine Co., J. S. ... 84
Munson Mill Mach. Co. ... 70

Orton & Steinbrenner ... 11
Osgood Co., The ... 74
Ottumwa Iron Works ... 66
Ohio Locomotive Crane Co. ... 82

Pennsylvania Crusher Co. ... 81
Pennsylvania Drilling Co. ... 82

Raymond Bros. Impact Pulv. Co. ... 4
Richardson Scale Co. ... 69
Robins Conveying Belt Co. ... 84

Sanderson Cyclone Drill Co. ... 78
Sauerman Bros. ... 82
Schaffer Eng. and Equip. Co. ... Inside front cover
Smith Eng. Works ... 67
Sturtevant Mill Co. ... 77

Taylor-Wharton Iron and Steel Co. ... Front cover
Thomas Elevator Co. ... 66
Toepfer & Sons Co., W. ... 84
Traylor Eng. and Mfg. Co. ... 8
Twin City Iron and Wire Co. ... 84
Tyler Co., The W. S. ... 59

Universal Crusher Co. ... 76
Universal Road Mach. Co. ... 77
Used Equipment ... 61-62-63

Vulcan Iron Works ... 65

War Department ... 61
Watt Mining Car Co. ... 80
Weller Mfg. Co. ... 73
Whitcomb Co., The Geo. D. ... 81
Williams & Co., C. K. ... 80
Williams Pat. Crusher and Pulv. Co. ... 70

IDEAS—

You could use an idea now and then, couldn't you?
You'll find plenty of new ones, short cuts and time savers in ROCK PRODUCTS.

Our traveling editors are running around, dropping in here and there finding out just how things are done, and then they tell you how the other fellow makes things hum.

Practical stuff—tested ideas—something *you* can use
Better fill out the blank and mail it to us today

ROCK PRODUCTS Date.....1922
542 So. Dearborn St., Chicago, Ill.

Please enter my subscription to ROCK PRODUCTS for.....year.... (one year $2.00, two years $3.00—please state which. You save a dollar by subscribing for two years), for which we enclose $..... Canadian and Foreign Subscriptions $3.00 a year.

Name.....

Street.....

City.....State.....

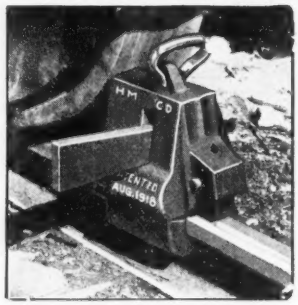
We produce:.....

.....

.....

We retail.....

McDermid Positive Rail Clamp



10 Days' Free Trial

Then if they do not live up to all our claims, we will pay charges both ways.

Here are a few satisfied users:

The Buffalo Slag Co., Buffalo, N. Y. The Solvay Process Co., Detroit, Mich. San Diego & Arizona Railway Co., San Diego, Calif. Columbia Quarry Co., St. Louis, Mo. New York Trap Rock Corp., New York City. N. Y. Vaccaro Bros. & Co., New Orleans, La. Salina Material Co., Muskogee, Okla. The Elmhurst Chicago Stone Co., Elmhurst, Ill.

McDermid Positive Rail Clamp Co. 4339 West End Ave., Chicago

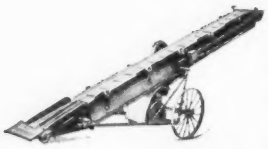
Quality and Service Always—

We manufacture screens in any desired wire material, in any style, or size of mesh. Uniform Double Crimped sand and gravel screens. Heavy screens for crushed stone. A large stock of galvanized wire cloth and fine mesh in either steel, copper or brass always on hand. "Everwearing" spring steel screens are practically indestructible.

Send for circular—prices always right

TWIN CITY IRON AND WIRE COMPANY
St. Paul, Minn.

Keep Your Eye



on the cost for moving bulk materials. It can be reduced if you put a **ROBINS PORTABLE** at work.

Write for Bulletin No. 57-R

ROBINS CONVEYING BELT COMPANY
New York Chicago Pittsburgh Boston

PERFORATED SCREENS
and Steel Plate Work

W. TOEPFER & SONS COMPANY
Milwaukee Wisconsin

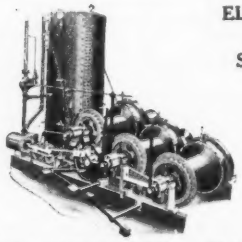
DERRICKS

TRADE MARK
MUNDY
ESTABLISHED 1869

GUY AND STIFF LEG

ELECTRIC AND STEAM

HOISTS



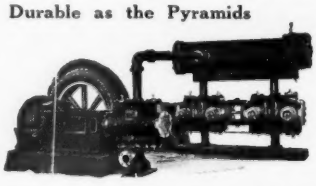
J. S. MUNDY HOISTING ENGINE CO.
NEWARK, N. J., U. S. A.

ULTIMATELY A BURY

"Universal" Variable Volume, 3-Cylinder 2-Stage Air Compressor. Why Not Install One Now?

Durable as the Pyramids

Silent as the Sphinx
All Sizes — All Types



All Pressures for All Requirements

BURY COMPRESSOR COMPANY
1721 Cascade Street Erie, Pa., U. S. A.

FLORY HOISTS

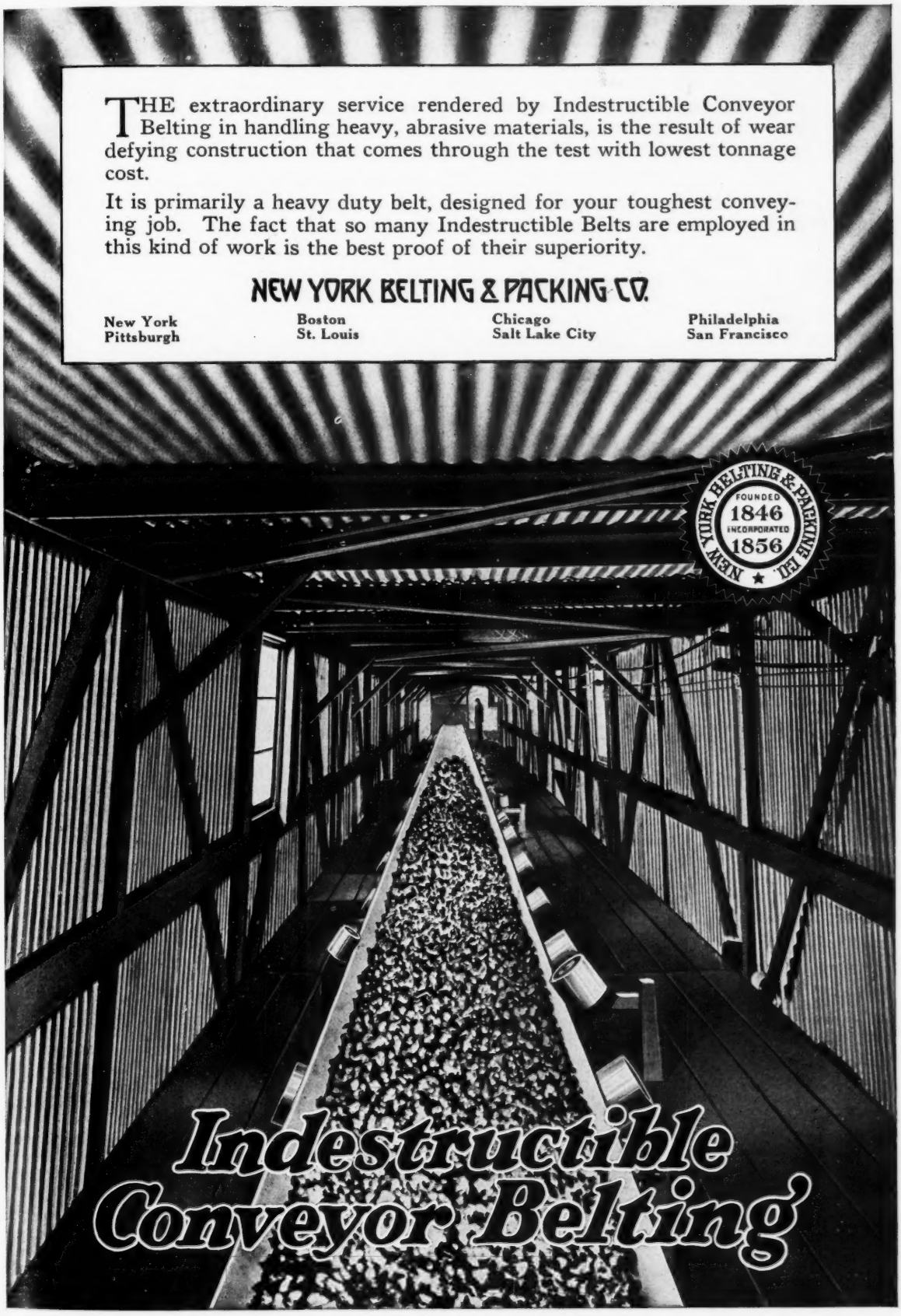
CABLEWAYS
DREDGING MACHINERY

A Flory Hoist for Every Purpose

CATALOG ON REQUEST

S. FLORY MFG. CO.
BANGOR, PENNSYLVANIA

New York, 95 Liberty St.; Pittsburgh, House Bldg.; Birmingham, Chas. T. Lehman; Chicago, Monadnock Block; Hartford, K. B. Noble Co.; Huntington, W. Va., Banks Supply Co.


THE extraordinary service rendered by Indestructible Conveyor Belting in handling heavy, abrasive materials, is the result of wear defying construction that comes through the test with lowest tonnage cost.
It is primarily a heavy duty belt, designed for your toughest conveying job. The fact that so many Indestructible Belts are employed in this kind of work is the best proof of their superiority.
NEW YORK BELTING & PACKING CO.
New York
Pittsburgh
Boston
St. Louis
Chicago
Salt Lake City
Philadelphia
San Francisco
NEW YORK BELTING & PACKING CO.
FOUNDED
1846
INCORPORATED
1856
Indestructible
Conveyor Belting